FCND DP No. 119

FCND DISCUSSION PAPER NO. 119

ASSESSING CARE: PROGRESS TOWARDS THE MEASUREMENT OF SELECTED CHILDCARE AND FEEDING PRACTICES, AND IMPLICATIONS FOR PROGRAMS

Mary Arimond and Marie T. Ruel

Food Consumption and Nutrition Division

International Food Policy Research Institute
2033 K Street, N.W.
Washington, D.C. 20006 U.S.A.
(202) 862–5600
Fax: (202) 467–4439

August 2001

ABSTRACT

The role of care as a critical influence on child nutrition, health, and development has received increasing attention in the last decade. While the role of care has been well elaborated at a conceptual level, we still lack simple, valid, and reliable tools to measure many aspects of care. In this review, experience with the measurement of selected childcare and feeding practices is summarized and implications for programs are discussed.

Hygiene practices

The use of interviews and recall methods is discouraged for the measurement of hygiene practices because research has shown that responses tend to be biased towards overreporting of "good" practices. Observational methods are therefore the method of choice, but they are subject to problems of *reactivity*—that is, that people behave differently in the presence of an observer—and normal day-to-day variability. Spot-check observations are an increasingly popular alternative, as they are less time consuming and costly and appear to be less reactive. However, like structured observations, they are subject to problems of day-to-day variability. Approaches to minimize biases and errors due to reactivity and day-to-day variability are discussed.

Feeding practices

Most feeding practice research has focused on the dietary aspects of feeding, and primarily on breastfeeding and complementary feeding. These practices are usually measured by maternal recall, but little evidence exists to document the reliability and validity of maternal recall of these practices. Recall *errors* may be particularly problematic when long recall periods are involved and when recall periods vary widely between respondents (e.g., when mothers of all children under 5 years of age are asked to recall early breastfeeding practices). Recall *bias* also may occur, especially following

education interventions, when individuals are aware of what the “correct” answer is. Suggestions for reducing recall errors and biases in research and program contexts are discussed.

Caregiver-child interactions during feeding

The new focus on care in nutrition research has led to recognition of the importance of additional, nondietary aspects of child feeding, which include a variety of caregiver-child interactions. The importance of the role of poor appetite has also been highlighted. Interactions include responsive feeding, encouragement to eat, response to poor appetite, and adaptation of feeding to the child’s developmental stage. Structured observations have been the method of choice for measuring these interactions, and various measurement scales have been developed, though most of them have not yet been validated. There is very limited experience with survey approaches, and it is probable that many aspects of these interactions will never be amenable to survey approaches. Attempts to operationalize and measure child appetite have been successful, and the use of a simple visual appetite analogue scale appears promising.

Additional considerations for programming and research

- There is evidence that good (or bad) practices tend to cluster, both within dimensions of care such as hygiene or feeding, and across dimensions. Also, it may be that a minimum number of good practices is necessary for health benefits to be obtained. For these reasons, composite indices or summary measures that combine various practices in one index may be useful. Additional research is needed to validate these indices.
- Program planning and design should be preceded by qualitative work in order to provide well-grounded and specific knowledge of practices, relevant norms, and potential constraints to adoption of optimal practices. In addition to guiding program design, this information should be used to inform selection of indicators and methods for monitoring and evaluation.

- Mixed methods, including both qualitative and quantitative approaches, are recommended at the planning stage, as well as in monitoring and evaluation stages, in order to maximize opportunities for triangulation of findings.

CONTENTS

Acknowledgments viii

1. Introduction 1

2. Evolution of the Conceptual Basis for the Role of Care 2

    The UNICEF Conceptual Model 2
    Positive Deviance Research and the Role of Care 5

3. Measurement of Hygiene Practices 6

    Focusing on Key Practicies 6
    The Use of Mixed Methods 9
    The Use of Structured Observations 11
        Summary Conclusions Regarding the Use of Structured Observations in Hygiene Practice Research 13
    The Use of Spot-Check Observational Methods 14
        Summary Conclusions Regarding the Use of Spot-Check Observational Methods in Hygiene Practice Research 25

4. Traditional Indicators of Child Feeding Practices 26

    Issues to Consider in Measuring Traditional Feeding Practices 27
        Child Feeding Is a Multidimensional Concept 28
        Feeding Practices Are Age-Specific 29
        Feeding Practices Are Likely to Cluster 31
        The Rationale for Creating Child Feeding Indices 32
    Summary of our Experience with the Creation and Use of Child Feeding and Care Indices 33
        The “Care” Index in the Accra Study 33
        The “Feeding” Index Constructed Using the Demographic and Health Surveys Data 37
    Conclusions About Traditional Indicators of Child Feeding Practices 39

5. Caregiver-Child Interactions During Feeding 40

    Conceptual Issues 40
        The Transactional Nature of Care 41
        Compensatory Versus Enhancement Care 41
        Level of Caregiver Control of Feeding and Child Anorexia 43

Measurement of Caregiver-Child Interactions During Feeding 44
Structured Observations Methods 46
Active and Responsive Feeding and Child Demand and Acceptance of Food 47
Other Measurement Approaches 55
Experience from the Accra Survey in Measuring Caregiver-Child Interactions During Feeding and Child Appetite 59
Summary Conclusions Regarding the Use of Survey Approaches in Feeding Interaction Research 64

6. Implications for the Measurement of Child Feeding and Hygiene Practices in a Program Context 65

Indicators 65
Validity, Reliability, and Reactivity 66
Recall Bias and Other Recall Errors 68
Context-Specificity 72
The Potential and Limitations of Indices for Program Monitoring and Evaluation 73
Methods 75
Mixed Methods 75
Consultative Research 76
Positive Deviance Inquiry 78
Conclusions 80

Appendix 1: Practices and Scoring System Used, by Age Group, to Create the Care Index (Child Feeding and Use of Preventive Health Services), Accra Study, 1997 85

Appendix 2: Variables and Scoring System Used to Create the Child Feeding Index for Infants 0-6 Months Old (Demographic and Health Surveys) 86

Appendix 3: Variables and Scoring System Used to Create the Child Feeding Index for Children 6-36 Months, by Age Group (Demographic and Health Surveys 87

References 88

TABLES

1 Summary of studies that used spot-check observational approaches to measure hygiene practices 16

2 Hygiene indicators measured by spot-check observations on two visits.....18

3 Summary of recent studies that have used observational methods to measure maternal-child feeding interactions and care during feeding.....48

4 Appetite score quartiles and caregiver responses to food refusal (children 6-23.9 months old) (Accra study).....61

5 Appetite analogue score quartiles and weight-for-height status (Accra study).....62

FIGURES

1 The extended model of care.....4

2 Quality of care, characteristics of the child, and consequences for growth.....7

3 Prevalence of diarrhea by hygiene index scores and socioeconomic status (SES).....25

4 The continuum of child feeding.....30

5 Association between care and malnutrition prevalence in Accra (AUFNS, 1997).....35

6 Care is more important for child nutrition among mothers with less education.....35

7 Mean height-for-age Z-scores (HAZ), by child feeding tercile (DHS Latin America) (children 12-36 months old).....38

8 Causes of anorexia and the potential relationship between anorexia and growth.....45

9 Potential for malnutrition under different combinations of sources of anorexia and degrees of parental control.....45

BOX

1 Exploring caregiver-child feeding interactions.....77

ACKNOWLEDGMENTS

This publication was made possible through the support provided to the Food and Nutrition Technical Assistance Project (FANTA) by the Office of Health and Nutrition of the Bureau for Global Programs Field Support and Research at the United States Agency for International Development, under the terms of Cooperative Agreement No. HRN-A-00-98-00046-00 awarded to the Academy for Educational Development (AED). The opinions expressed herein are those of the author(s) and do not necessarily reflect the views of the U.S. Agency for International Development.

Mary Arimond and Marie T. Ruel
International Food Policy Research Institute

1. INTRODUCTION

The objective of this report is to summarize progress towards measurement of selected childcare and feeding practices, and to discuss the feasibility and usefulness of these measurements in research and program contexts. This is the third in a series of reports documenting insights regarding care and measurement of care gained from the Accra Urban Food and Nutrition Study (AUFNS) (Armar-Klemesu and Ruel 2000; Ruel, Armar-Klemesu, and Arimond 2001). This last report complements the previous two by providing an extensive review of the published literature on experience with the measurement of selected dimensions of care.

The overall aim of the Accra study was to gain an understanding of the nature of urban poverty and of the relationships between poverty, food insecurity, and malnutrition in a major urban African center.[1] The specific role of childcare practices as one determinant of the nutritional status of children was a significant sub-theme of the study. One major component of the AUFNS was a representative survey of 556 households carried out in early 1997. The survey included modules designed to measure selected care practices; specifically, care practices were included if they could be approached by cross-sectional survey and home spot-check observational methods. Several infant and child feeding practices, as well as spot-check proxies for hygiene practices, were included.

In the following section**,** the conceptual basis for the role of care as a determinant of child nutritional status is briefly reviewed. The relationship between care and the concept of "positive deviance" in child nutrition is also discussed. Following this general discussion of the conceptual framework, the report focuses on selected feeding and hygiene practices. Recent literature relating to measurement of these practices using a variety of approaches is reviewed and experience from the Accra study in measuring these concepts using survey methods is summarized. We begin with a review of measurement of hygiene practices, since this area of research is relatively well developed and because several recent studies address measurement issues that are of general

[1] See Maxwell et al. (2000) for a full description of the study.

methodological relevance. Next we present two sections reviewing measurement of child feeding practices. The first one covers “traditional” indicators related to breastfeeding and complementary feeding practices, while the second covers the “newer” issues relating to feeding interactions and child appetite. Based on the review, the final section discusses implications for the measurement of care practices in the context of programs.

2. EVOLUTION OF THE CONCEPTUAL BASIS FOR THE ROLE OF CARE

THE UNICEF CONCEPTUAL MODEL

Child survival, nutrition, health, and development all depend on household food security, on a healthy environment and available health services, and on the care available for children and women (UNICEF 1990). This three-pronged model—where food, health, and care are each considered necessary but not sufficient—is currently widely accepted but represents a conceptual evolution from earlier and simpler models of the determinants of child welfare.

In particular, the role of care as a component of the model has received considerable attention in the last decade. Care and nurturing of children is rooted as deeply as any human behavior, and has been intimately studied by anthropologists and others. However, recognition of the significance of care is “new” in the sense that prior to the 1990s, much research and policy work related to child nutrition and, indeed, child survival ignored the role of care.

Consideration of several types of evidence led researchers and policymakers to a new emphasis on the role of care practices. Evaluations of interventions that had succeeded in improving availability of food and/or income had often shown little or no impact on child growth or nutrition. This raised questions about the other constraints on child growth and nutritional status, and resulted in further examination of both the role of ill health and the role of intrahousehold distribution processes. At the same time, a group of “positive deviance” studies had begun identifying caregiving behaviors that allowed children to grow and flourish in impoverished environments. Taken together, these

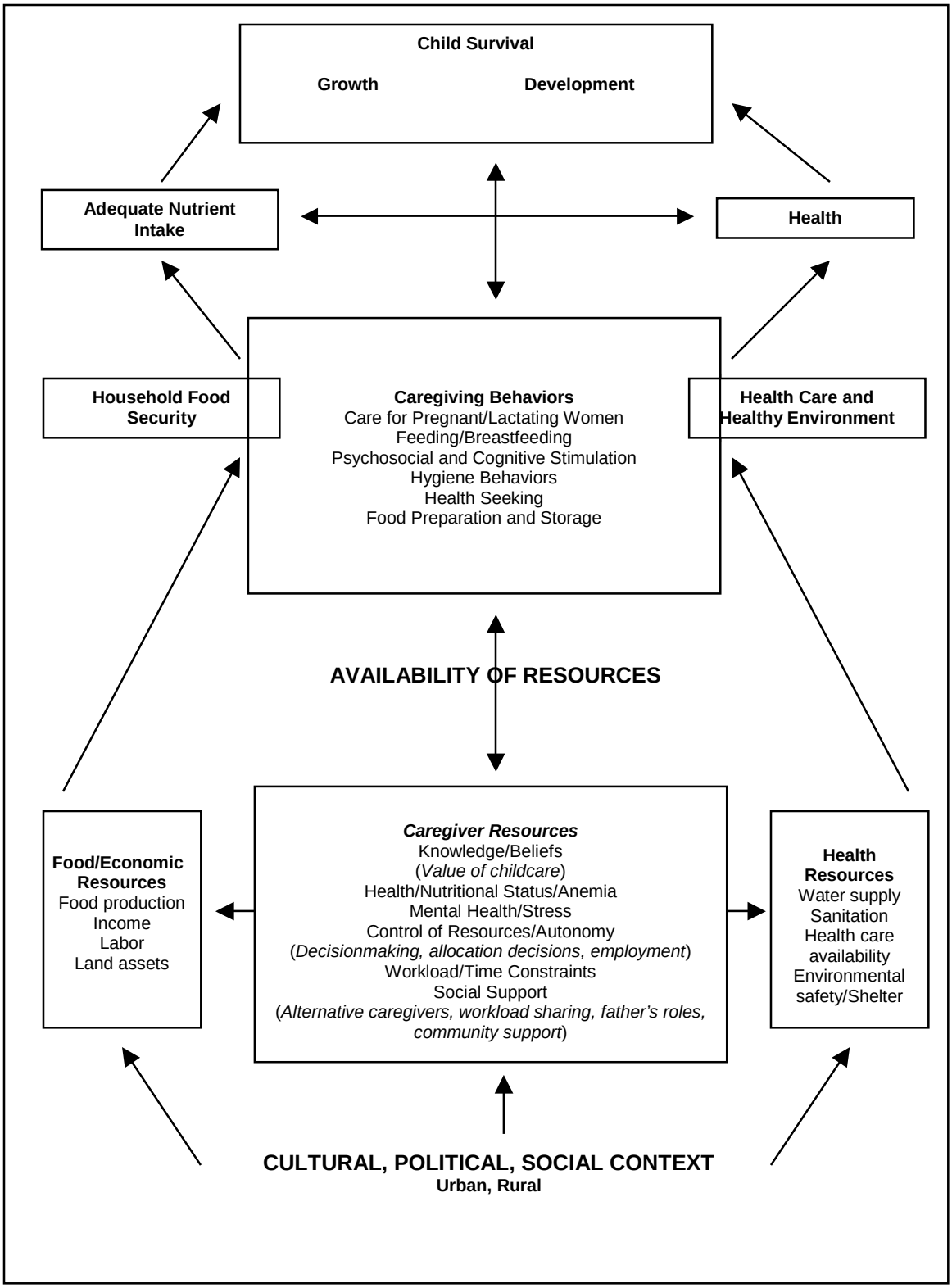
disparate findings suggested a role for a variety of intrahousehold processes and caregiving behaviors.

In order to ensure adequate and systematic inclusion of care in research and policy efforts, UNICEF provided leadership in the development of concepts and models related to the role of care. The original conceptual model incorporating care (UNICEF 1990) broadly defined care as "the provision in the household and the community of time, attention and support to meet the physical, mental, and social needs of the growing child and other household members" (ICN 1992).

An "extended" model of care gave a more detailed articulation of both care practices and important household- and community-level resources for care (see Figure 1). Relevant behaviors were categorized into (1) care for pregnant and lactating women; (2) breastfeeding and the feeding of very young children; (3) psychosocial stimulation of children and support for their development; (4) food preparation and food storage behavior; (5) hygiene behaviors; and (6) care for children during illness, including care-seeking behavior (Engle 1992). Resources for care were summarized into six major categories: (1) education, knowledge, and beliefs; (2) health and nutritional status of the caregiver; (3) mental health, lack of stress, and self-confidence of the caregiver; (4) autonomy, control of resources, and intrahousehold allocation; (5) workload and time constraints; and (6) social support from family members and the community (Engle, Menon, and Haddad 1996; Jonsson 1995). The extended model provided a unifying and hierarchical framework for research seeking to illuminate the relative importance and specific role of various care practices and resources for care.[2]

[2] The reader is referred to a number of documents for further discussion of conceptual issues. The UNICEF model was further elaborated in the UNICEF-Cornell Colloquium on Care and Nutrition of the Young Child (*Food and Nutrition Bulletin* 16 (4), 1995). The colloquium aimed to provide "a systematic review and integration of available knowledge" concerning the role of care in determining nutritional status, growth, and behavioral development. Progress towards measuring various constructs in the model is summarized in Engle, Menon, and Haddad (1996). This document also elaborates the extended model and provides a discussion of the "transactional" nature of care and a number of child-level factors that may influence caregiver behavior. Several recent publications provide suggestions for integrating care in the context of programs (Engle and Lhotska 1999; Engle, Bentley, and Pelto 2000).

Figure 1—The extended model of care



Some components of the model have received much attention, both in the years preceding the emergence of the model and subsequently (e.g., breastfeeding and complementary feeding practices, hygiene-related practices, and some care resources, including maternal education and work status and intrahousehold allocation), while information on others remains scanty in the developing country context (e.g., care for women, maternal-child interactions, other aspects of psychosocial care, and the influence of maternal mental health, stress, autonomy, and self-confidence).

POSITIVE DEVIANCE RESEARCH AND THE ROLE OF CARE

Positive deviance research provides a corrective to an exclusive focus on stunting and poor growth, and aims to identify caregiver behaviors and other factors that result in relatively good growth in impoverished environments.[3] While some studies have linked positive deviance in growth to a variety of resource-related factors such as socioeconomic status, maternal wealth, and parental literacy, a main focus has been on caregiver/ maternal behaviors. Thus, positive deviance research is linked to the concept of care, particularly in the area of program research and action.

Positive deviance research also represents one response to recognition of the inevitably slow pace of basic structural change in society (e.g., reductions in poverty and increases in equity). The positive deviance approach—in both research and programming—seeks feasible and incremental behavioral changes, identified within communities, which can lead to improvements in child nutrition and health in the short term and in the absence of desired structural changes.

Researchers have used the positive deviance concept in a number of ways. Some researchers, using cross-sectional data, have divided children into growth groups and have looked for correlates of deviance in growth (e.g., Guldan et al. 1993a; Kumar Range, Naved, and Bhattarai 1997). Some have defined growth groups longitudinally

[3] See, e.g., Muñoz de Chavez et al. 1974; Wishik and Van der Vynckt 1976; Mata 1980; Dettwyler 1986; Zeitlin 1991; Zeitlin, Ghassemi, and Mansour 1991; Shekar, Habicht, and Latham 1991 and 1992; Guldan et al. 1993a; Zeitlin 1996; Merchant and Udipi 1997; Kumar Range, Naved, and Bhattarai 1997.

(i.e., incorporating both attained growth and rate of growth into definitions) and again looked for correlates (e.g., Shekar, Habicht, and Latham 1991; Merchant and Udipi 1997). Some have focused only on distinguishing "positive deviants" from other children, while other researchers have studied the characteristics of "negative deviants" as well.

The term "positive deviants" also applies to caregivers when they engage in those practices that help children thrive. In fact, positive deviance research and programs presume that exceptional caregivers exist in all cultures. This has been variously described as excellent "maternal technology" (Mata 1980; Zeitlin, Ghassemi, and Mansour 1990), or the *cuidadosa* (careful) mother (Monte et al. 1997), or the mother with good nurturing skills.

Zeitlin, Ghassemi, and Mansour (1990) have illustrated the complex relationship between characteristics intrinsic to the child, maternal competence or "technology" (i.e., care), and outcomes, including positive deviance, as shown in Figure 2. According to this view, outcomes for children depend on both the endowed characteristics of the child and on maternal competence: very healthy, robust, adaptable children may grow well and thrive even in the absence of extremely good care, while extremely good care is critically important for the smallest and weakest.

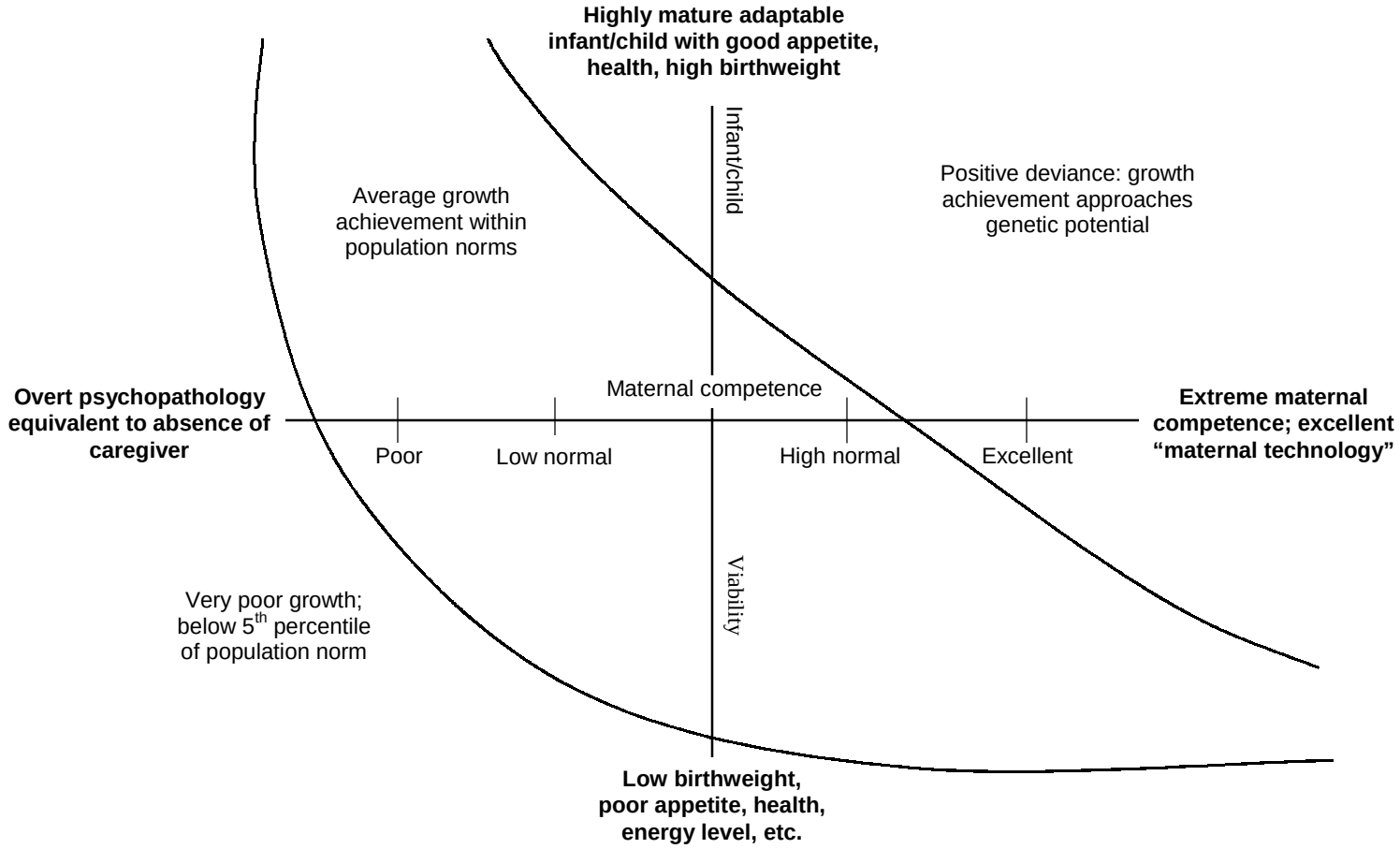
Research on the role of care, as well as interventions that seek to improve caregiving practices, require measurement tools for the constellation of practices that comprise "excellent 'maternal technology'." In the sections that follow, we review progress towards the measurement of a subset of care practices for which experience exists in developing countries and that were measured in the Accra study.

3. MEASUREMENT OF HYGIENE PRACTICES

FOCUSING ON KEY PRACTICES

Hygiene practices have been the focus of a wide range of studies and interventions, and a number of reviews are available (Boot and Cairncross 1993;

Figure 2—Quality of care, characteristics of the child, and consequences for growth



Adapted from Zeitlin, Ghassemi, and Mansour 1990, page 44.

Cairncross and Kochar 1994; Almedom 1996; Curtis, Cairncross, and Yonli 2000). While information gaps still exist, knowledge about measurement of hygiene practices is relatively well-developed. Hygiene practices have been grouped into five clusters (Boot and Cairncross 1993):

1. Disposal of human feces;
2. The use and protection of water sources;
3. Water and personal hygiene;
4. Food preparation and storage; and
5. Domestic and environmental hygiene.

There appears to be an emerging consensus identifying several domestic hygiene practices as both critical for positive health and nutrition outcomes, and of universal relevance. These include the disposal of children's feces, cleaning children after defecation, and hand washing at critical times: after defecation, after cleaning children, and before food preparation, eating, and feeding children (Almedom 1996).

In one recent review, Curtis, Cairncross, and Yonli (2000) go further by differentiating between primary and secondary barriers to transmission, and indicate that the former are more critical. Primary barriers are practices that prevent contamination of the environment in the first place, and include safe stool disposal and hand washing after contact with stools.[4] Secondary barriers are hygiene practices that stop pathogens in the environment from multiplying and reaching new hosts; examples are treating water, or washing hands before preparing food, feeding children, or eating. Curtis and colleagues (2000) recognize the importance of a range of hygiene practices, but emphasize that when

[4] A wide range of studies have identified safe stool disposal (and particularly disposal of children's stools) as critical (Alam and Wai 1991; Ekanem, Akitoye, and Adedeji 1991; Dikassa et al. 1993; Aulia et al. 1994; Traore et al. 1994; Zeitlin et al. 1995; Oyemade et al. 1998). Each of these studies also identified other factors, but safe stool disposal was identified in all.

planning hygiene promotion interventions, both the existence of resource constraints among target audiences and the need to keep messages simple argue for prioritization of a few simple practices. In the context of interventions, *and* "in the absence of local evidence to the contrary," they advocate a focus on primary barriers.

It should be noted, however, that a variety of hygiene intervention programs—representing attention to a combination of both primary and secondary barriers—have reported successes in reducing the incidence or prevalence of diarrhea (see, e.g., Alam et al. 1989; Thongkrajai et al. 1990; Ahmed et al. 1993; Haggerty et al. 1994; Hoque et al. 1996; Pinfold and Horan 1996; Shahid et al. 1996; Quick et al. 1999). One careful observational examination of weaning food hygiene practices specifically identified multiple decontaminating and recontaminating behaviors in the process of food preparation (Monte et al. 1997); these authors emphasized the importance of close observation of processes and context-specific practices when prioritizing behaviors to target with education and behavior change interventions.

THE USE OF MIXED METHODS

A second, methodological area of consensus that seems to be emerging from the literature in both research and program contexts is the usefulness of mixed methods. Researchers and practitioners concur that the creative use of combined qualitative, semi-quantitative, and quantitative methods yields richer information and results in more effective programs than any single method (Cairncross and Kochar 1994; Almedom 1996; Kaltenthaler and Drašar 1996; Curtis et al. 1997; Monte et al. 1997; Yeager et al. 1999). As is the case with many human behaviors, there is no "gold standard" available for the measurement of hygiene practices. Thus, in the absence of an ideal measurement method, triangulation between methods provides the best approach to validation of information.

Various studies and projects have mixed and sequenced the following elements in a variety of ways: in-depth and key informant interviews, focus groups, other participatory rapid assessment tools, unstructured and structured observations, survey

questionnaires, and hygiene spot-check observations.[5] Microbiological methods, involving sampling bacteria from hands, have also been proposed as a proxy measure of effective hand-washing practices (Kaltenthaler and Pinfold 1995; Pinfold and Horan 1996).

A number of multiphase projects have begun with qualitative components (see, e.g., Almedom 1996; Kaltenthaler and Drašar 1996; Shawyer et al. 1996; Curtis et al. 1997; Monte et al. 1997). The use of in-depth interviews, focus groups, and a variety of other participatory tools has provided detailed information describing the nature and range of practices, and in some cases detailing the cultural context and motivations for prevailing practices. When quantitative estimates of prevalence are needed, other methods must be employed. Surveys may provide quantitative information regarding hygiene knowledge and attitudes and regarding various demographic and socioeconomic correlates of hygiene. However, it has been recognized that interviews are of limited usefulness for the measurement of hygiene practices. A number of studies have demonstrated that respondents consistently and significantly overreport "good" practices (Stanton et al. 1987; Curtis et al. 1993; Odujinrin et al. 1993; Manun'Ebo et al. 1997). As a result, many researchers have employed structured observations, which usually involve many hours of observation by fieldworkers in the homes of the study subjects. A less intrusive and invasive approach that has gained increasing popularity in recent years is the use of spot-check observations, which also require a home visit, but which can be carried out in a very short period of time (5-10 minutes), depending on the number of conditions to be observed.

Experience with both structured observations and spot-checks is reviewed next and an emphasis is placed on quantitative studies that have measured hygiene practices (or proxies for hygiene practices) and examined their association with children's diarrhea or growth. The objective of the review is to understand the strengths and weaknesses of

[5] Hygiene spot-check observations usually consist of training and standardizing fieldworkers to observe a set of predetermined factors during home visits. The observations are usually "proxies" for behaviors (such as whether mothers' hands are clean, whether the house is swept), as opposed to observations of the practices themselves, and require very little time compared to structured observations of actual practices. (See Section 3 for additional information.)

each method, to review knowledge about the validity and reliability of these methods, and to provide recommendations to programs for the identification of simple indicators of hygiene behavior and effective approaches to measurement.

THE USE OF STRUCTURED OBSERVATIONS

Structured observations involve the systematic recording of practices by passive observers. Recording methods vary: observers may code a behavior as present or absent, they may record the frequency of a behavior, or they may record frequency and duration as well as other contextual factors. While structured observations can provide detailed information and quantitative estimates of the prevalence of various practices, they have three disadvantages. First, they are very time- and labor-intensive and require careful standardization of skilled observers. Second, a caregiver's behavior may be altered by the presence of an observer, as it is natural to want to present a good image (this has been referred to as "reactivity"). Finally, even if behavior is not altered due to the presence of the observer, it may vary from day to day. These latter two concerns have led to questions regarding the validity (whether the measurement reflects the truth) and reliability (repeatability, i.e., whether repeated measurements provide the same answer) of structured observations.

Reactivity—that is, changes in practices attributable to the presence of the observer—compromises both validity and reliability. The observer cannot see the true, usual practice (so the measure is not valid) and the practice changes between visits (so the measure is not reliable). Reliability (or repeatability) of measures can also be assessed separately both at the individual and the population level. Reliable population-level measures may be sufficient for baseline and post-intervention studies that are conducted in order to assess the overall impact of an intervention on the population. For studies that are intended to link practices to outcome measures (such as child diarrhea or growth), however, reliable individual- or household-level measures are needed.

Several recent studies in Burkina Faso and Nicaragua have explored the validity and reliability of structured observations, through using repeated observation visits to

households (Curtis et al. 1993; Cousens et al. 1996, Gorter et al. 1998). The Burkina Faso report (Cousens et al. 1996) focused on practices surrounding defecation, as well as other hand washing practices. The Nicaragua study (Gorter et al. 1998) included observations of 46 practices, covering all five "clusters" of hygiene behavior (disposal of human feces, the use and protection of water sources, water and personal hygiene, food preparation and storage, and domestic and environmental hygiene). Both research groups conclude that, in general, relevant hygiene practices have very low repeatability at the individual level; that is, there is a lot of day-to-day variability (both due to reactivity and to other day-to-day variation). This means that studies that need an individual- or household-level measure of risk (e.g., studies linking hygiene practices to outcomes such as diarrhea) will probably require more than one observation period.

At the population level the results of both studies showed good consistency between repeated measures for a number of practices, thus demonstrating low reactivity. Cousens and collaborators (1996), who were explicitly analyzing the issue of reactivity, however, found that reactivity varied between practices in the Burkina Faso study. Some practices were not reactive and had good repeatability at the population level, whereas others had poorer repeatability (because they were reactive). For example, the proportion of index children using a potty declined only slightly over three observations (from 68 percent to 63 percent), suggesting low reactivity. The proportion defecating on the ground, however, increased from 5 percent to 16 percent, showing evidence of reactivity.[6] Other examples of reactive behaviors included washing the child after defecation, which declined from 95 to 85 percent over the three observations, and maternal hand washing after using the latrine, which decreased from 36 percent on the first observation to 22 percent on the third one. Several other important behaviors did not appear to be reactive. These included whether or not the child's stools were disposed of,

[6] In this cultural context, it was considered acceptable for children to defecate on the ground and "shameful" for them to defecate in clothes; the researchers' interpretation was that women were more likely to clothe their children for the first observational visit, leading to more "accidents" in the clothes. In this context, the practice of allowing children to defecate on the ground was more reactive than the use of potties. However, this was not because defecating on the ground was viewed as bad, but because children were dressed up for the first visit from the observer.

and the site of stool disposal (latrine versus yard versus outside the yard), both of which showed little variability between visits.

The Nicaragua study (Gorter et al. 1998) also found that a large number of the practices they observed were repeatable (reliable) at the population level. At the household level, it was not possible to fully assess repeatability, because they found it difficult to obtain repeat observations of a number of key practices (e.g., hand washing). This meant that although the overall sample size was adequate, sample sizes for repeated observations of some key practices were very small.

In their analysis of the relationship between hygiene practices and diarrhea, they showed that practices from all five "clusters" of hygiene behavior were associated with diarrhea. They also note that "diarrhea-free" families practiced good behaviors more frequently and consistently and that good behaviors tended to cluster. Although the authors report being unable to create composite hygiene scores with their data due to missing values (which would have resulted in unacceptably small sample sizes for indices), they recognize that because of the clustering of practices, composite indices may usefully distinguish high-risk from low-risk households.

Summary Conclusions Regarding the Use of Structured Observations in Hygiene Practice Research

- Indicators from structured observations can be useful for measuring hygiene practices, but they must meet the following criteria:
    - The indicator must be valid—meaning it represents the truth;
    - The indicator must be reliable—meaning it is repeatable. The two main threats to reliability are the problems of reactivity, e.g., that individuals/households modify their behaviors because of the presence of observers, and normal day-to-day variability.
- If reactivity is a problem, the indicator should be used neither at the population level nor at the individual level (say, to relate specific practices to outcomes). At

the population level, reactivity will result in a systematic bias towards "better" practices than normal. At the individual level, associations between practices and outcomes will not be detected (or will be false) because the practices will not reflect the truth.

- If repeatability is a problem because of day-to-day variation, the indicator can be used at the population level. The bias introduced by day-to-day variation is a random bias; thus, the variability in the estimate will be larger, but the estimate itself will not be systematically biased in one direction or the other. The use of repeated observations (on different days) will reduce the size of the random error.
- The validity and reliability of indicators are highly context specific, largely because of differences in reactivity between contexts and cultures. Validity and reliability studies in a variety of contexts are thus urgently needed.
- Prior qualitative work is highly recommended for the identification of context-specific practices most relevant for observation.
- Structured observations require a substantial investment in training and standardization of fieldworkers and in time spent in the field, and may therefore be prohibitively expensive in many program contexts.
- There is some evidence that hygiene practices tend to cluster and, thus, the use of composite indices may be useful.

THE USE OF SPOT-CHECK OBSERVATIONAL METHODS

Spot-check observational methods consist of observing a list of predetermined conditions at one point in time during a home visit to study subjects, as opposed to recording observations over an extended period of time, as in structured or unstructured observations. Spot-check observations provide a snapshot of the conditions or aspects to be observed and they are intended to identify the product of hygiene behaviors rather than the behaviors themselves (Bartlett et al. 1992). For example, the spot observation that mothers' hands and nails are dirty is presumed to reflect the fact that mothers do not wash their hands frequently (or carefully). Thus, spot-check observations provide information

on “proxies” for behaviors and by definition do not require that fieldworkers wait for the practices to be observed. The main advantage of the approach is that fieldworkers can make a series of observations—of people, households, compounds, etc.—in a very short time. Depending on the number of items to be observed, spot-check observations may take only 5 to 10 minutes. Another advantage is that skilled observers can usually carry out the observation without the respondent being aware that it has taken place. As is the case for all types of observations, however, the method requires very careful training and standardization of fieldworkers in making subjective, yet consistent and reliable, judgments (Armar-Klemesu et al. 2000).

Most reports detailing experience with spot-check methods illustrate their usefulness in the context of multi-stage, multi-method projects. To our knowledge, no research has been undertaken specifically in order to assess the validity, reactivity, or repeatability of spot-check indicators or indices. It is possible that spot-checks—by their nature less prolonged and more discrete forms of observation—might induce less behavior change. However, if households are anticipating the visit of the study team, the general level of cleanliness of individuals and of the house and compound might not represent day-to-day conditions. A general rule to avoid this is to refrain, whenever possible, from informing target households of the exact day and time the fieldworkers will visit them.

A summary of studies that have used spot-check observational methods is presented in Table 1. The table provides a brief summary of the study designs and the types of hygiene indicators and composite indices used, and also summarizes the key findings regarding analyses of validity, repeatability, and association with child outcomes where appropriate.

Of the seven studies reviewed, only the information provided by Gorter and collaborators (1998) allows consideration of the issues of reactivity and repeatability. Table 2 lists the indicators measured by spot-check observations in this study and shows the results of measurements made on two separate observation days. Good agreement is

Table 1—Summary of studies that used spot-check observational approaches to measure hygiene practices

Author/ reference/ country	Type of study	Types of hygiene indicators	Index creation	Analyses and findings	
				Validity/ reactivity/ reliability/repeatability analyses	Association with childhood diarrhea (and growth)
Gorter et al. 1998 (Nicaragua)	Prospective follow-up study (172 households); children < 24 months	-Utensils covered -Cleanliness of environment, floor -Barrier against animals present -Garbage: present around the house, type of disposal used -Water: availability, storage, quantity -Sanitation facilities: cleanliness -Child uses diapers, underclothes		*Reactivity:* compared results of two observations. Good agreement between two measures (low reactivity). *Repeatability*: used Kappa statistic to assess individual- and household-level repeatability. Results: low repeatability for 10 indicators (Kappa < 40), good for 12 indicators (Kappa 40-75), excellent for 4 indicators (Kappa > 75).	*Individual practices:* Four indicators were associated (kitchen floor clean, living room floor clean, garbage organized or absent, child uses diaper or underclothes).
Bartlett et al. 1992 (Guatemala)	Prospective year-long study of persistent diarrhea; children 0-30 months of age	-Cleanliness of mother, child, siblings -Water storage -Children's toys, bottles on floor -Feces on ground -Fecally soiled diapers -Animals in compound, house -Garbage in living area	*Index:* created for each of the 26 indicators: no. times unhygienic behavior observed/ no. times indicator observed; created two categories: high/low, based on individual distribution of each variable. *Composite index:* summed six variables significant in multivariate analysis.		*Individual indices:* Compared children with no persistent diarrhea (during 1 year) with those who had $\geq$ 1 episode. Eleven of the 26 indices associated with diarrhea; 9 remained significant in multivariate analyses (logistic regression). *Composite Index:* Ten percent of the children with 0-1 unhygienic condition had an episode of persistent diarrhea in previous year, compared to > 50 percent among those with all six unhygienic conditions (dose response relationship was found).
Ahmed et al. 1993 (Bangladesh)	Longitudinal study of impact of behavioral change intervention (185 households) with children 0-18 months	-Cleanliness of child's hands, face, clothes -Cleanliness of mothers' sari -Cleanliness of two areas on the ground where child most often played	*Scale*: average cleanliness score for the ground, child's face, hands, and mothers' sari	*Reliability:* Chronbach's alpha > 0.57	*Scale (composite index):* Strong negative association (controlling for maternal education and socioeconomic status)

Author/ reference/ country	Type of study	Types of hygiene indicators	Index creation	Analyses and findings	
				Validity/ reactivity/ reliability/repeatability analyses	Association with childhood diarrhea (and growth)
Pinfold and Horan 1996 (Thailand)	Longitudinal focused behavior change intervention, 25 intervention and 12 control villages (4,874 households) Children < 60 months	-Bacterial on fingertips (faecal streptococci) -Cleanliness of dishes			*Individual practices:* Difference of 45% between homes where no dirty dishes were seen on three visits, compared to those with dirty dishes on three visits.
Merchant and Udipi 1997 (India)	Longitudinal positive and negative deviance in growth (500 children 6-36 months)	-Cleanliness of floor, storage vessels -Storage conditions of food, water -Cleanliness of child's nails, skin, face, clothes	Each indicator was rated as poor, average, good		*Individual practices:* No analysis of association with diarrhea, only with growth*:* linear relationship between growth and clean-liness and storage of water and food: good practices were observed in 72% of positive deviants, 56% of median growers, and 39% of negative deviants (no control for confounding factors reported).
Kaltenthaler and Drašar 1996 (Botswana)	Mixed method study to guide design of intervention study	-Water storage - Size of house -Presence of animals -Feces in compound -Leftover food, infant bottles -Compound conditions (4-point scale) -Presence of unwashed dishes, washing water -Presence of toilet	*Index*: included compound condition, plate, cloth, caregiver fingertip bacteria counts, distance to water source, toilet, animals in kitchen, feces in compound.		*Individual practices:* None were significantly associated with diarrhea. *Index*: significantly more diarrhea among highest compared to lowest quartile of hygiene index (no information on magnitude of effect)
Armar-Klemesu et al. 2000 (Ghana)	Cross-sectional survey of 556 households with children < 36 months	-Mother clean -Child clean -Diaper/bottom clean -Compound swept -No poultry feces -No stagnant water -No human feces -No unwashed utensils -Drinking water covered -House swept -No garbage container in house	*Index* was created by summing scores to first six indicators. Each good and bad practice was rated 1 and 0, respectively. Scores were divided in three categories (based on distribution): poor hygiene (0-3 good practices), average (4-5), and good hygiene (6 good practices)	*Reliability*: Cronbach's alpha: 0.69 (good internal consistency)	*Individual practices:* Nine of 11 practices associated with lower prevalence of diarrhea (only three statistically significant: child clean, compound swept, no stagnant water). *Index*: Diarrhea prevalence: 40% for those with 0-3 good practices, 32% for those with average practices, and 25% for those with good practices (statistically significant). Multivariate analysis: stonger association among poorer and wealthier households than average SES.

Note: Abbreviation: SES = socioeconomic status.

Table 2—Hygiene indicators measured by spot-check observations on two visits

Indicators of good hygiene practices	Number of families observed twice	Observations		
		First	Second	Kappa
Utensils covered	171	8	9	0.66
Kitchen floor clean at onset of the observation	171	29	29	0.43
Living room floor clean at onset of the observation	170	32	34	0.29
Barrier against animals in the house	171	4	3	0.48
Garbage organized in little heaps or not present	171	33	32	0.36
Garbage (if present) >1.7 meters from house	115	55	56	0.31
Cover on well is in use	122	21	20	0.65
More than two water vessels in house	170	40	45	0.46
More than 25 gallons stored in vessels	170	50	50	0.69
No dirty paper in and around latrine	108	91	91	0.23
No feces on slab of latrine	108	94	98	-0.03
Child uses a diaper or underclothes	170	78	77	0.56

Source: Adapted from Gorter et al. 1998, pp. 1093-1094.

demonstrated between first and second observational visits for most indicators, suggesting low reactivity.

The kappa statistic in the last column (Table 2) is used to assess individual- / household-level repeatability. The authors state that scores from 0.40 to 0.75 are generally considered to indicate good repeatability, and scores over 0.75 indicate excellent repeatability.[7] Of the 12 indicators listed, less than half (5) had a kappa coefficient lower than 0.40 (indicating "poor" repeatability), and 7 were in the range of "good" repeatability (between 0.40 and 0.75). There was no apparent clustering of indicators by type of those that had low compared to good repeatability.

With regard to the association between hygiene indicators and diarrhea, only four hygiene variables were found to be significantly associated with diarrhea in this study: living room floor clean, kitchen floor clean, garbage organized in heaps or absent, child uses diaper or underclothes. The absence, or the weakness, of the association between diarrhea and other hygiene indicators at the household level may have been due to the

[7] Other authors (e.g., Cousens et al. 1996) rate kappa scores from 0.40-0.59 as "fair," 0.60-0.79 as indicating "substantial" agreement, and 0.80-1.0 as "almost perfect."

low to moderate repeatability of the hygiene indicators. Conversely, indicators with good repeatability, which were nevertheless not associated with diarrhea, may not have been key risk factors in this context (e.g., availability of sufficient water). As suggested by the same authors (Gorter et al. 1998) in their analyses of structured observations, it is also likely that there may be some threshold number of good practices required to reduce the risk of diarrhea. This would explain the lack of association with diarrhea for many of the individual practice indicators. For example, a spotless kitchen floor and clean utensils will not protect a child who plays on the ground in an unhygienic compound. Some cluster of key practices may be necessary, and may be better reflected by summary scales or indices.

Bartlett and collaborators (1992) incorporated 26 spot-check indicators in their longitudinal study of persistent diarrhea among children aged 0-30 months in Guatemala. Households were visited weekly throughout the year, and every two days during episodes of diarrhea. The 26 indicators were based on “extensive preliminary observations” in the community and included cleanliness of the mother, child, sibling, and household environment (Table 1). For each indicator, an index was calculated by dividing the number of times the condition was unhygienic by the number of times the indicator was observed for that household. These indices were then classified as “high” or “low,” based on their respective distributions. Finally, the dichotomous variable giving a score of high or low on each condition was compared between households where the index child had no episodes of persistent diarrhea during the year, and households where the child had one or more episodes.

Eleven of the 26 variables were found to be associated with persistent diarrhea in bivariate analyses; 9 of these remained significantly associated in logistic regression analyses controlling for the child’s age and a number of other potential confounders. The nine variables were toys or baby bottles on the ground; mother’s hands dirty; trash on the floor of the house; animals loose inside the house; and feces on the ground; or fecally soiled diapers on the child or on the ground (either inside or outside the living area).

The authors make three other important points in this report. First, they rightly noted that indicators relating to the presence of fecally soiled diapers can be effects rather than (or as well as) causes of diarrhea, and that the possibility of reverse causality should receive attention when these indicators are used. Second, and consistently with others, they noted that behaviors cluster. Of the 55 possible paired correlations between the 11 conditions associated with diarrhea, they reported that 38 (69 percent) were significant. Finally, the authors analyzed the cumulative effect of hygiene practices on the risk of diarrhea. They created a composite index by summing six of the nine variables that were significant in the multivariate analysis (the "dirty diaper" variables were excluded because of possible reverse causality). They found a highly significant dose-response relationship, with only 10 percent of the children with 0-1 unhygienic conditions experiencing an episode of persistent diarrhea in the previous year, compared to over 50 percent of those with all six unhygienic conditions.

In Bangladesh, Ahmed et al. (1993) used spot-check indicators of cleanliness in addition to structured observations and other methods in a pre-post evaluation of an educational intervention. Cleanliness of the child's hands, face, and clothes, and of the mother's sari were assessed and combined in a scale, along with cleanliness of the two areas on the ground where the child most often played. Reliability of this and other scales was assessed using Cronbach's alpha and deemed to be satisfactory.[8] The cleanliness score was strongly and negatively correlated with the prevalence of diarrhea in multivariate models that controlled for mother's education and socioeconomic status.

Pinfold and Horan (1996) also report use of a spot-check indicator as part of the evaluation of a focused behavior change intervention in Thailand. This intervention focused on dish washing and hand washing, and used a spot-check of cleanliness of

[8] Because it is often impossible for researchers to perform repeated measurements at two points in time, a variety of statistical techniques have been developed for assessing reliability. Cronbach's alpha is a widely accepted statistic for assessing the reliability and internal consistency of scales developed from a single set of measurements (one point in time) (Carmines and Zeller 1979). Ahmed et al. (1993) did not report alpha individually for each scale, but stated that all had alpha of at least 0.57 and that this was satisfactory. DeVellis (1991) suggests that an alpha of 0.60-.065 is considered low, 0.65-0.70 is considered acceptable, 0.70-0.80 is respectable, and 0.80-0.90 is good. Carmines and Zeller (1979) suggest that alpha should be 0.80 or higher for "widely used" scales.

dishes, along with microbiological methods for assessing fecal streptococci on fingertips (taken as an indicator of the effectiveness of hand washing). In this instance, the spot-check was used to assess behavior change related to a very specific project message. The authors report “significant improvements” in intervention villages although the magnitude of observed changes is not reported. In control villages, the authors report a 45 percent difference in incidence of diarrhea between homes where no dirty dishes were seen on three separate occasions as compared to homes where dirty dishes were seen on all three occasions. No multivariate analyses were reported.

In Bombay, Merchant and Udipi (1997) included hygiene spot-check indicators in their positive deviance study. The authors explored the association between hygiene behaviors and growth, but did not study the association with diarrhea. Positive deviants, negative deviants, and median growers were identified using both growth velocity and attained weight as criteria. The spot-check observations included cleanliness of the floor, storage vessels, and the storage condition of food and water. Each indicator was rated as poor, average, or good and an inspection was done of the cleanliness of the child’s nails, skin, face, and clothes (Table 1). Results indicated linear relationships between growth status and the cleanliness and storage of water and food. These were rated as “good” in 72 percent of the homes of positive deviant children, in 56 percent of median growers, and in 39 percent of negative deviants. Conversely, these conditions were rated as “poor” in 41 percent of the homes of negative deviants, 20 percent of median growers, and 12 percent of positive deviants. Negative deviants were more likely than either median growers or positive deviants to have dirty fingernails and boils or rashes. These findings should be interpreted with caution, however, because control for socioeconomic status or for the age of the child was not reported either in the design of the study (by matching subjects) or in the statistical analysis (by using multivariate analyses).

A study in Botswana (Kaltenthaler and Drašar 1996) used mixed methods to examine the association between hygiene behavior and diarrheal diseases. Qualitative methods were used first (focus groups, unstructured observations and in-depth key informant interviews), followed by a quantitative survey (n = 116), which included data

on socioeconomic status, diarrheal morbidity, and child anthropometry, in addition to hygiene spot-check observations and bacteriological sample collection (of water, dishes, cleaning rags, infant feeding bottles, and hands)[9]. The final phase included additional focus groups and in-depth interviews. The authors describe this set of activities as relatively inexpensive and easy to implement in contrast to structured observations. They strongly advocate the use of mixed methods, and presumably would not employ their spot-check indicators in isolation from the other methods. The spot-check indicators used in this study included various aspects related to the use and storage of water, general hygiene conditions of the house and compound, and availability of services (see Table 1). Individually, neither the spot-check indicators nor the bacteriological indicators were found to be associated with diarrhea. As it appeared that hygiene practices clustered, an index was developed, combining the condition of the compound, plate, cloth, and caregiver fingertip bacteria counts, distance to water source, toilet ownership, animals in the kitchen, and feces in the compound. The index was scored from 8 - 20 and divided into quartiles. Comparison of the lowest to highest quartile showed significantly "more diarrhea" among households in the lowest quartile, although the magnitude of the difference is not reported.

Finally, our experience with the use of spot-check hygiene indicators in the Accra (AUFNS) study is summarized (Armar-Klemesu et al. 2000; Maxwell et al. 2000). The hygiene spot-check observations in this study included 11 indicators: maternal and child cleanliness,[10] whether the house and compound were swept, presence or absence of feces, presence of garbage in the house, stagnant water in the compound, and presence of unwashed utensils or plates.[11] Each variable was scored "1" when the practice was good and "0" otherwise. A simple hygiene index was created by summing up the scores for all

[9] Bacteriological sampling is not considered a spot-check method but is mentioned here because it was included in the composite index of hygiene indicators created in this study.

[10] In order to qualify children and mothers' cleanliness, fieldworkers were instructed to focus on the appearance of their hands, nails, clothes and hair. For children, the cleanliness of their face was also assessed.

[11] Fieldworkers were carefully trained and standardized in assessments of each indicator, until perfect concordance was achieved between pairs of fieldworkers and between each fieldworker and the supervisor.

items that were available for at least 90 percent of the households; this meant excluding four indicators. In addition, the "human feces on the compound" indicator was eliminated because it did not have any variability (feces were observed in only 2 percent of the households). The final index included six of the hygiene indicators observed (see Table 1 for variables included). A categorical variable was created based on the distribution of the index scores. Households with 0-3 good practices (scores of 0-3) were classified as having "poor" hygiene (34 percent of households), those with 4-5 good practices had "average" hygiene (37 percent), and those with the maximum score of 6 were classified as having "good" hygiene practices (29 percent of households). Cronbach's alpha was 0.69, indicating a good level of internal consistency.

Most of the individual variables were associated in the expected direction with the prevalence of diarrhea in the previous two weeks among children aged 6-36 months—poor practices were associated with a higher prevalence of diarrhea. Few relationships, however, reached statistical significance. As discussed, there are several likely reasons for this, including potential unreliability in spot-check indicators and the possibility that some cluster of good practices—versus any single practice—is necessary in order to decrease risk. In this instance, the limited nature of the information available on diarrhea (one two-week recall) is also a constraint. Given all these constraints, the fact that some relationships were detected suggests that the spot-checks did reflect some real and relevant differences between households.

To verify the notion that a minimum cluster of hygiene practices is necessary to reduce risk, we looked at the association between our composite index and various child outcomes. The composite index was significantly associated with diarrhea, and the difference followed a strong dose response relationship. Up to 40 percent of children from households with poor hygiene (scores 0-3) were reported to have had diarrhea in the previous two weeks, compared to 32 percent among those with average hygiene (scores 4-5) and 25 percent among those with good hygiene (score of 6).

In previous analyses of the data, we documented that the hygiene index was strongly associated with several socioeconomic variables, namely maternal education,

housing quality and assets, and availability of waste disposal, water and sanitary facilities (Armar-Klemesu et al. 2000). To verify whether the association between the hygiene index and childhood diarrhea remained when these socioeconomic and environmental factors were controlled for, we used a logistic regression model.[12,13]

A two-way interaction was found between the quality of housing and asset index (a proxy for household wealth) and the hygiene index.[14] The benefit of good hygiene practices on reducing the prevalence of diarrhea was larger among households from the two extreme wealth terciles (Figure 3). Children from the lowest socioeconomic group were approximately half as likely to have had diarrhea in the previous two weeks if their household was in the good hygiene, compared to the poor hygiene, group. Although overall, children from the highest socioeconomic group were less likely to have had diarrhea than children from the lowest socioeconomic group, good hygiene practices were also associated with an almost twofold difference in the prevalence of diarrhea among the higher socioeconomic group (30 and 16 percent for households with poor and good hygiene, respectively). The unexpected pattern and lack of clear association between hygiene and diarrhea among the middle-income group is hard to explain. Thus, the findings suggest that in this population, good hygiene practices among poor households could mitigate the negative effects of a poor environment on diarrhea. Children from the lowest socioeconomic group who lived in households with good hygiene had approximately the same level of diarrhea as the average prevalence among the higher socioeconomic group (22 percent). The reason why good practices were not

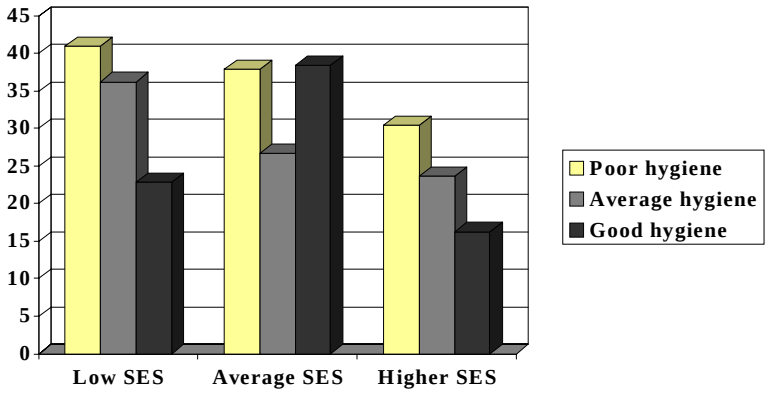
[12] The model included child age, maternal age, education and height, household expenditure, quality of housing and asset index, and hygiene practices (3 groups).

[13] The quality of housing and asset index was created using principal components analysis. The variables included in the original model were a "possession" index (sum of ownership of: refrigerator, electric stove, tape deck, and television set); quality of housing (construction material for roof, walls, and floors); source of drinking water; and availability of sanitary facilities and garbage disposal. The final model, which explained 46 percent of the total variance in the constituent variables, included only variables with loadings equal or greater than 0.5 (floor, walls, water source, possession index, and sanitary facilities).

[14] We also tested whether there was an interaction between maternal education and the hygiene index, but the interaction was not statistically significant.

beneficial among households from the middle socioeconomic group needs to be investigated further.

Figure 3—Prevalence of diarrhea by hygiene index scores and socioeconomic status (SES)



Summary Conclusions Regarding the Use of Spot-Check Observational Methods in Hygiene Practice Research

- Spot-check indicators, which are relatively inexpensive and easy to measure, represent a promising approach to assessment of certain hygiene practices.
- Although experience exists with the use of spot-check methods for hygiene, additional work is needed to assess their validity, reactivity, and repeatability in various cultures. It is possible that some of this work could be done through reanalysis of existing data.
- Work triangulating between spot-checks, structured observations, and other methods would be particularly valuable for assessing validity. Spot-check

indicators may be most useful in the context of a mixed-method approach, where triangulation is possible.

- Limited available information does suggest that spot-check observations may be less reactive than structured observations, and, on average, at least as repeatable.
- As with indicators derived from structured observations, spot-check indicators may be most useful for population-level assessments.
- Evidence of clustering of hygiene practices and of the potential usefulness of composite indices is also confirmed in studies that have used spot-check observations.

4. TRADITIONAL INDICATORS OF CHILD FEEDING PRACTICES

There is an extensive literature addressing the nature, determinants, and effects of a wide variety of breastfeeding and complementary feeding practices. These practices, herein named the "traditional" feeding practices, are those that are directly related to the nutritional and dietary aspects of feeding, as opposed to the caring aspects of feeding such as caregiver-child interactions (discussed in Chapter 5) and psychosocial care. Hygiene in food preparation and storage, and food safety issues are also not included in this definition of traditional practices, which is limited to the following:

1. Breastfeeding:
    - Initiation (timing)
    - Use or non-use of colostrum
    - Exclusive versus not exclusive for 0-6 months
    - Duration of any breastfeeding
    - Frequency
    - Intake of breast milk (weighed or estimated using breastfeeding frequency)
2. Complementary feeding
    - Age of introduction

- Quality of diet:
    - Dietary diversity: number/types of foods or food groups
    - Frequency of intake of specific foods or food groups
- Quantity of food and/or nutrients ingested
- Texture, density
- Frequency: number of meals/snacks

3. Others:
    - Utensils used: baby bottles, cups, spoons, use of hands

The practices listed above have been the subject of a variety of studies. Current knowledge and areas of consensus about optimal feeding practices are summarized in a recent state-of-the-art review by Brown, Dewey, and Allen (1998). The following section reviews measurement issues related to these practices.

ISSUES TO CONSIDER IN MEASURING TRADITIONAL FEEDING PRACTICES

The vast majority of studies looking at traditional feeding practices have used quantitative survey recall methods to collect information on child feeding practices. This is true for studies that aim at documenting the prevalence of specific feeding practices (Rutstein 1996), as well as those that examine the association between feeding practices and child outcomes (Victora et al. 1989; Popkin et al. 1990; Brown et al. 1989; Marquis et al. 1997), or feeding practices and their determinants (Piwoz et al. 1994; Galler et al. 1998; Martorell et al. 1985). Even impact evaluation studies of education and behavior change interventions (Caulfield, Huffman and Piwoz 1999) usually rely on interview methods to record changes in behaviors, although these are particularly subject to biases from respondents answering what they have learned as opposed to what their actual practices may be.

Surprisingly little has been done to test the validity and reliability of recall methods for the measurement of child feeding practices. Dettwyler (1986) in her research on infant feeding in Mali mentions in passing that internal consistency checks

demonstrated that parental responses to the question about age of introduction of solid foods were not accurate indicators of when solid foods were actually introduced.

An additional problem with recall questions concerning child-feeding practices is the differential length of recall time between mothers of children of different ages. Recall questions about early infant feeding (the first 6 months) are frequently used to document both rates of exclusive breastfeeding in a population, and the timing of introduction of various liquids and foods. When this is done among a group of mothers with children up to 36 or 60 months, some mothers must recall events that occurred more than 3-4 years prior to the interview. Understandably, their recollection may be less precise than that of mothers of young infants. Other factors that may influence maternal recall include the birth order of the child (mothers of a first child are likely to have a better recollection of events that happened in the first year than mothers of a tenth child); whether the mother works outside the home and uses alternative caregivers; and the level of maternal control over child feeding decisions.

Observational methods and other qualitative approaches have also been used in research on child feeding practices, especially in studies that seek to document the cultural, social, and overall context in which specific practices take place, and to understand the potential barriers to modifying these practices. Formative research using a series of qualitative tools, for example, has been used extensively to guide the design of communication and behavior change programs aimed at modifying breastfeeding and complementary feeding practices (Favin and Baume 1996; Dickin, Griffiths, and Piwoz 1997). This area of work is not discussed here but will be addressed in Section 6 of this report. The remainder of the section focuses on key issues related to the measurement of child feeding practices through quantitative survey approaches, and includes a discussion of the use of child feeding and care indices.

Child Feeding Is a Multidimensional Concept

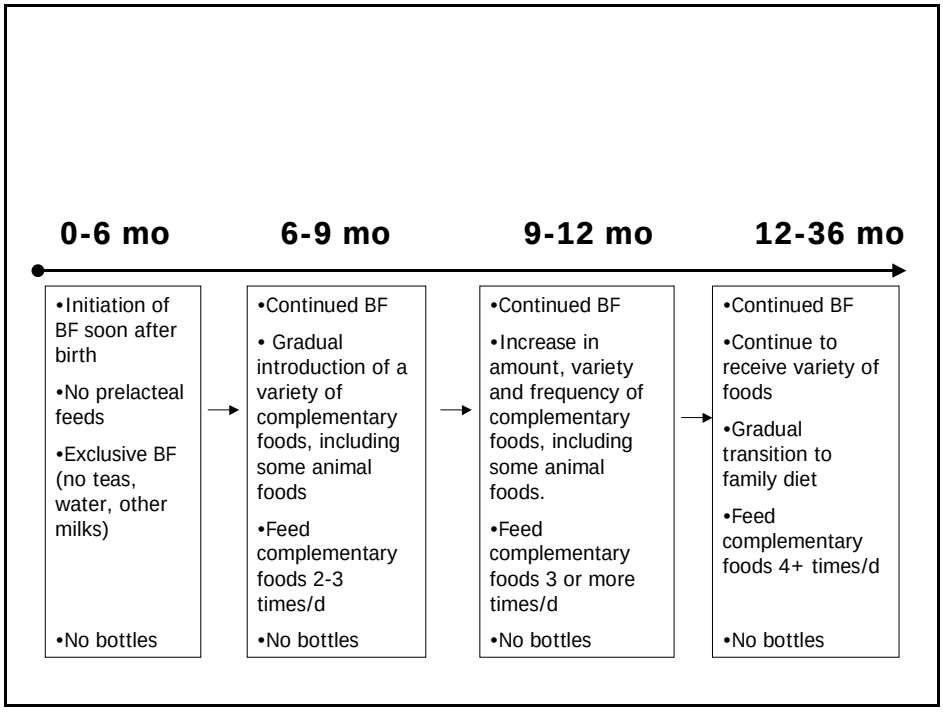
Child feeding, which includes breastfeeding and complementary feeding practices, is comprised of various dimensions, namely, the type, the quality, the texture

and the nutrient density of food, the frequency of feeding, and the diversity of the diet. These various dimensions are difficult to combine into one indicator and thus, most research on feeding practices has focused on only one or two dimensions at a time. This has resulted in fragmented information, and has prevented progress in understanding the association between overall feeding patterns (as opposed to one single feeding practice) and child health and nutrition outcomes. For example, although there is undisputable evidence that exclusive breastfeeding protects against diarrheal infections and mortality from diarrhea (Popkin et al. 1990; Brown et al. 1989; Victora et al. 1989), the question of whether early initiation of breastfeeding and feeding colostrum to the child confer additional nutritional and health benefits to the child has not been answered. To our knowledge, no study has explicitly included these three dimensions in an analysis of the association between breastfeeding and child outcomes. The same is true for complementary feeding practices. Some studies have isolated the role of animal products (Marquis et al. 1997) or of individual micronutrients such as zinc (Brown, Peerson, and Allen 1998; Zinc Investigators' Collaborative Group 1999) in improving growth or reducing childhood morbidity, but these studies often failed to include other dimensions of complementary feeding such as the frequency of feeding or the age of introduction of complementary foods, to name only a few.

Feeding Practices Are Age-Specific

Appropriate child feeding practices are age-specific, and they are also defined within very narrow age ranges. They follow a continuum from exclusive breastfeeding, starting soon after birth, to the complete adaptation of the child to the family diet. As seen in Figure 4, exclusive breastfeeding is the key feeding practice of concern up to 6 months of age, but after this age indicators reflecting the use of complementary foods (quality, quantity and frequency) must be included. Similarly, both the introduction of complementary foods (between 6 and 12 months of age) and the transition from special foods to the family diet ideally should be accomplished gradually. Thus, in order to

Figure 4—The continuum of child feeding



Source: Ruel and Menon (in revision).

characterize the adequacy of child feeding practices, one needs to take into account the various dimensions of child feeding, as well as the age-specific requirements of the child within short time periods. Again, the complexity of this task probably explains why so little is known about the association between different feeding patterns and child outcomes at particular ages.

A related problem, which was mentioned earlier, is the potential error caused by the differential recall period among mothers of children of different ages, when information is gathered retrospectively as in most surveys. When the magnitude of recall error varies between groups (e.g., age groups) the likelihood of detecting relationships also varies between groups.

Finally, another potential problem when using recall methods is age censoring, which happens when questions are asked about practices that are expected to happen at a certain age. In the case of child feeding practices, this problem is likely to occur when

questions about age of introduction of specific foods or liquids are asked. The best approaches to address this problem are to either make the questionnaire age-specific or to carry out the analysis by age group and to include only age-relevant questions.

Feeding Practices Are Likely to Cluster

As discussed for hygiene practices, it is possible that child-feeding practices also cluster. That is, it is likely that a mother who initiates breastfeeding at birth and who exclusively breastfeeds for 6 months will also be more aware of (or more likely to seek expert information about) recommended optimal complementary feeding. By definition, a mother who exclusively breastfeeds also engages in other positive practices during this period, such as avoiding baby bottles and breast milk substitutes. It is also very possible that practices may cluster across other dimensions of care, such that mothers with better feeding practices may also be more nurturing and attentive to the child and/or have better hygiene practices.

Little research has been done to examine these questions, but recent analyses documenting the apparent long-term impact of exclusive breastfeeding on children's growth have raised some questions as to whether the effect is truly a long-term impact, or whether it is due to the clustering of good practices. It may be that exclusive breastfeeding is a good proxy for other positive practices occurring both during the period of exclusive breastfeeding and thereafter.

In their prospective study of Vietnamese children, Hop and collaborators (2000) provide convincing evidence that early introduction of solid foods (< 3 months of age) is associated with poor growth up to 48 months of age. The authors, however, failed to control for current diet in their modeling of child growth up to 4 years. Their analysis adjusted for other factors such as child gender, family size, maternal education and family income, but did not include current child feeding practices or dietary information (although it appears that this information was available). Thus, although the analysis was carefully conducted, one cannot rule out the possibility that the apparent beneficial effect of exclusive breastfeeding during the first three months may have been due to a series of

other good practices throughout childhood, in addition to the early exclusive breastfeeding.

In our cross-sectional survey in Ghana, we also found that children 6-18 months of age who had been exclusively breastfed during their first four months of life were significantly taller than those who had not been exclusively breastfed (Ruel, Armar-Klemesu, and Arimond 2001). The association disappeared, however, in multivariate analyses that controlled for maternal height, education, and socioeconomic characteristics. This was due to the fact that exclusive breastfeeding was highly correlated with some maternal characteristics that were also positively related to child growth. In this sample, mothers who exclusively breastfed were an elite group of more educated and wealthier mothers. Exclusive breastfeeding in this sample turned out to be a proxy for maternal education and socioeconomic status, and for a series of other positive childcare behaviors. We showed previously that maternal education was consistently associated with various good feeding and hygiene behaviors (Armar-Klemesu et al. 2000). Unfortunately, the possible positive impact of exclusive breastfeeding on growth among children of non-educated mothers could not be analyzed because very few of the non-educated mothers exclusively breastfed. It is likely that exclusive breastfeeding would have been particularly beneficial for children in this group.

These findings highlight the difficulties of studying the impact of practices such as exclusive breastfeeding that cannot be randomized among mothers. For this reason, they are subject to self-selection biases (as in the case of the Accra study), which cannot always be controlled for in the analysis.

The Rationale for Creating Child Feeding Indices

Child feeding indices have the potential to address some of the above-mentioned concerns related to the analysis and interpretation of child feeding patterns. In particular, indices can be made age-specific and they can include various dimensions of feeding (and care) practices. Also, as discussed in the hygiene section (Section 3), if practices cluster or if there is a minimum number of good practices required to achieve long-term

benefits, a composite index would be more likely to detect these associations than would measurement of any single practice.

Indices combine various dimensions of the concept studied into one variable, which can then be used to quantify relationships. In the case of childcare and feeding practices, the use of indices allows researchers either to quantify the importance of these combined practices for child nutrition and health outcomes, or to look globally at the main constraints to good practices. In addition, because of the possibility of making the various components of the index age-specific, use of this method allows the analysis to be carried out over a wider age-range. This is particularly useful when sample sizes among some age groups are small and do not allow for within age-group analyses. Our experience with indices is summarized below.

SUMMARY OF OUR EXPERIENCE WITH THE CREATION AND USE OF CHILD FEEDING AND CARE INDICES

The "Care" Index in the Accra Study

The composite childcare index created using data from the Accra study included three dimensions of care: (1) traditional child feeding practices (breastfeeding, use of prelacteal feedings, and timing of introduction of complementary liquids and foods in the child's diet); (2) caregiver-child interactions (who helped the child eat and how the caregiver responded to the child's refusal to eat); and (3) preventive health seeking behavior (attendance at growth monitoring and whether the child had been immunized). The index was created only for children 4 months and older; child-feeding patterns could not be fully determined among younger infants because the information was censored (for example, termination of exclusive breastfeeding or introduction of solid foods may not yet have occurred at the time when mothers were interviewed). The index was made age-specific by carefully selecting both the variables and the scoring system that were relevant for each age group (4-8.9; 9-17.9; $\geq$ 18 months). Appendix 1 presents the list of variables and the scoring system used to create the index (for more details about the methodology, see Ruel et al. 1999).

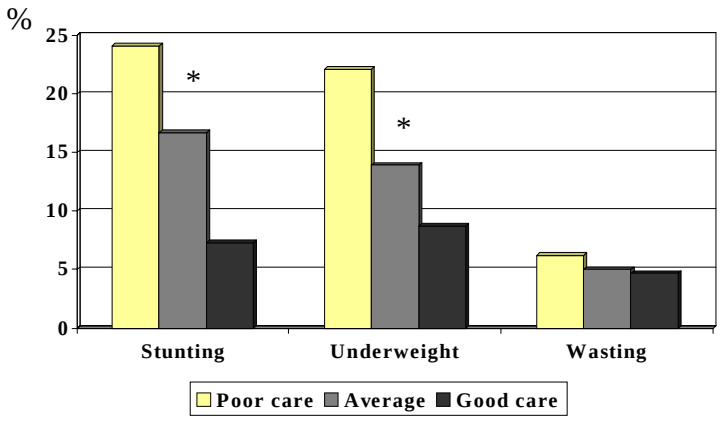
The general scoring system was to allocate a score of -1 for a bad practice and a score of 0 for a good practice (Appendex 1). When a practice was particularly good, such as using fortified cereals for complementary feeding, a score of +1 was given. Practices were considered good or bad based on current child feeding recommendations (WHO 1995; Brown, Dewey, and Allen 1998) and on available scientific evidence about their benefits or risks. For example, breastfeeding between 4 and 9 months of age was given a score of +1 because it is a recommended practice and it is known to have a protective effect on children's health; not breastfeeding was graded -1 (potentially detrimental to the child). For older children in the 9-18 months group, however, not breastfeeding was given a score of 0 because it is not clear whether or not breastfeeding at this age really has a negative effect on children's health and growth. Scientific evidence on this issue is mixed (Brown, Creed-Kanashiro, and Dewey 1995).

For age-censored practices such as immunizations for DPT and measles, which are expected to occur when the child reaches a certain age, the variables were included in the index only for the age group that was older than the recommended age for receiving each immunization. For instance, full DPT immunization is expected to be completed by 3 months of age, and therefore the variable was included in all age groups. Measles immunization, which is to be given at 9 months of age, was included only for children 9 months and older.

The index was created for each age group by adding up the scores obtained for the different practices. Terciles were created to form three categories of caring practices: (1) poor, (2) average, and (3) good.

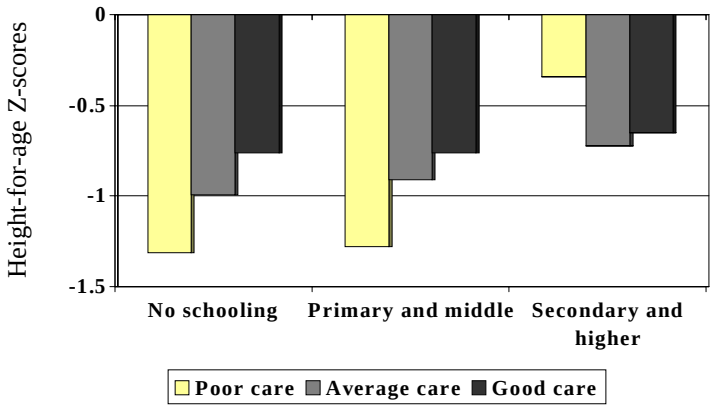
The index proved to be a very useful tool for examining associations between childcare and nutritional status. It allowed us to look not only at bivariate relationships, but also to consider the importance of care for nutrition in multivariate models that controlled for other known child, maternal, and household determinants. In addition, the index allowed us to summarize the information into simple, yet insightful and easily interpretable graphical representations such as Figures 5 and 6, which can be particularly useful for advocacy.

Figure 5—Association between care and malnutrition prevalence in Accra (AUFNS, 1997)



* Statistically significant (Chi-Square test, $p<0.05$)

Figure 6—Care is more important for child nutrition among mothers with less education



Statistically significant interaction (care * maternal education) in ordinary least squares regression model, controlling for child age, maternal age and height, housing quality and asset index, and expenditure.

Clearly, the index has limitations and should be regarded as the very first step in the development of a methodology to measure and quantify the different dimensions of care. The main limitations of our index include the following: first, the amount of information available on the different concepts was limited. For example, only two questions were asked about caregiver-child feeding interactions. Second, most of the child feeding information related to feeding during the first 6 months of life. As noted earlier, this information is subject to differential recall *bias* problems associated with the age of the child. Additionally, since a large proportion of children were older than 6 months, the questionnaire should have included data on current child feeding practices as well. Information on dietary quality and frequency of feeding, for example, would have been particularly useful.

It is also questionable whether separate indices reflecting individual dimensions such as traditional feeding practices, caregiver-child interactions, and preventive health seeking behavior in the case of Ghana, are preferable to a single global index. There are clearly advantages and disadvantages to both approaches. The main disadvantage of creating multiple indices is that it defeats one of the main purposes of creating an index, which is to combine various dimensions into a single variable and to assess globally the association with child outcomes. The advantage is merely the converse of this concern. By splitting the index into its individual dimensions, one can evaluate the role of each of the dimensions for child outcomes, and also study the relationships between the various dimensions. Ultimately, the choice of a particular approach should be guided by the specific objective of the research.

In a follow-up analysis of the Accra study, the care index was split into two separate indices: (1) a child feeding index, which included both the traditional child feeding and the caregiver-child feeding variables; and (2) a preventive health seeking behavior index (Armar-Klemesu et al. 2000). The objective of this particular analysis was to look at the constraints to childcare practices and to determine whether the constraints were the same for child feeding, health seeking, and hygiene (see discussion of this index in Section 3). The findings showed both differences and similarities in the constraints to

good care practices between dimensions. For instance, low maternal education was consistently associated with poorer practices in all three dimensions, whereas socioeconomic factors only affected practices related to hygiene. These results highlight that the two approaches to using indices provide different insights and that the purpose of the analysis should guide the type of index used.

The "Feeding" Index Constructed Using the Demographic and Health Surveys Data

The main goal of creating a child feeding index using the Demographic and Health Surveys (DHS) was to assess the feasibility of creating such an index with these widely available, nationally representative datasets (Ruel and Menon, in revision; Menon and Ruel 2000). Although not all DHS surveys include a child-feeding module, a large number of them do and thus provide a rich source of information on child feeding and nutrition in developing countries. We were hoping that by demonstrating the feasibility and usefulness of creating a child feeding index, we could help promote wider and better use of the rich information provided by the DHS surveys at the national and international levels.

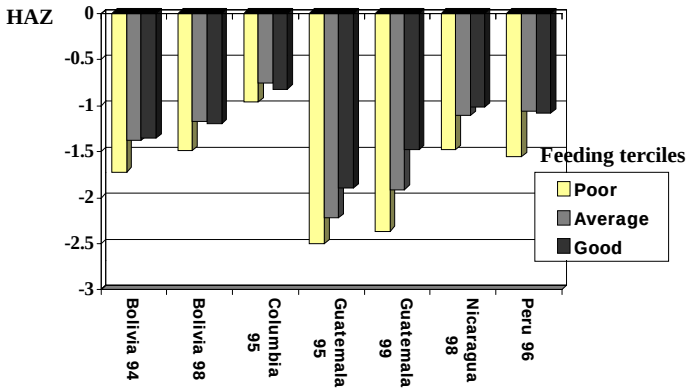
An attractive aspect of the DHS surveys is that the information available on child feeding practices is quite complete, much more so, for instance, than in our Accra dataset. This allowed us to explore the feasibility of creating a child-feeding index using a larger number of child-feeding dimensions than in our previous work. With the DHS data, we created a child-feeding index that included the following dimensions: breastfeeding practices (current); dietary diversity (use of various complementary foods and liquids in the past 24 hours); food frequency (frequency of use of various complementary foods and liquids in the previous 7 days); and meal frequency (in the past 24 hours). Other aspects of feeding, such as caregiver-child interactions, are not included in the DHS surveys.

Using a similar methodology as in the Accra study, the index was made age-specific (both in the variables included and in their coding) for 0-6, 6-9, 9-12, and 12-36 month age groups (see Appendixes 2 and 3 for variables and coding used, by age group).

Feeding terciles were also derived to categorize feeding practices into poor, average, and good.

Data from five Latin American countries (seven datasets) were used. As in the Accra study, results showed a significant association between the index (in this case of child feeding practices) and child nutritional status reflected in height-for-age Z-scores (Figure 7). Differences as large as 0.9 Z-scores were observed between the lowest and highest feeding terciles in Guatemala (’95) and differences close to one-half a Z-score were found in both Peru and Nicaragua. These findings were confirmed by multivariate analyses that controlled for child, maternal, and family characteristics. Interesting country-specific interactions were also identified between the child feeding index terciles and specific maternal and socioeconomic characteristics. These were useful in identifying subgroups for which the association with child nutrition was larger, and who, therefore, would be more likely to benefit from interventions to improve child-feeding practices.

Figure 7—Mean height-for-age Z-scores (HAZ), by child feeding tercile (DHS Latin America) (children 12-36 months old)



Note: all differences were statistically significant (ANOVA, $p < 0.05$).

In conclusion, our experience with constructing a child-feeding index with DHS datasets was successful and our analyses showed that child-feeding practices in Latin America were strongly associated with nutritional status. In addition to its great potential for advocacy purposes, the method also allowed the identification of vulnerable groups and thus could be used for targeting interventions.

CONCLUSIONS ABOUT TRADITIONAL INDICATORS OF CHILD FEEDING PRACTICES

- Traditional indicators of child feeding practices are widely used and appear to be useful, although their validity and reliability has not been established.
- Of special concern is the potential problem of differential quality of recall between mothers of children of different ages; this should definitely be addressed in future studies.
- Composite indices have the potential to address some of the methodological problems related to the quantitative measurement of child feeding practices. Namely, they can address the multi-dimensionality of child feeding practices (the need to consider the type, quality, texture, and nutrient density of food, as well as the frequency of feeding and diversity of the diet); the age-specificity of child feeding practices; and the fact that feeding practices may cluster, or that a minimum number of good practices might be necessary to have an impact on child outcomes.
- Our experience with the feasibility and potential usefulness of creating composite child feeding indices with the Accra study and with DHS datasets from Latin America was encouraging and suggests that this is a promising area for future development and program applications.
- The main advantage of creating a composite index is that it allows construction of one variable representing various dimensions of feeding or care practices. This variable, in turn, can be used to model and illustrate graphically the importance of

child feeding or care for child outcomes or to model their determinants. This can be invaluable for advocacy.

- Indices are flexible enough to allow for either including only one dimension of feeding (or care) or multiple dimensions. The decision about the optimal approach should be guided by the specific goal of the analysis.

5. CAREGIVER-CHILD INTERACTIONS DURING FEEDING

CONCEPTUAL ISSUES

The recent focus on care has resulted in the study of additional child feeding practices to those described in the previous chapter, many of which involve caregiver-child interactions. Study of these practices has been one result of the identification, in the conceptual care literature, of several concepts relevant to care that had previously received little attention in the nutrition literature. These include

- The "*transactional*" nature of care, including the influence of the child's characteristics on caregiver behavior (Engle, Menon, and Haddad 1996);
- The distinction between "*compensatory care*" and "*enhancement care*" (Engle 1992); and
- The importance of *anorexia* and the modifying role of the level *of caregiver control over feeding* (Engle, Bentley, and Pelto 2000).

In this section, we will first describe these conceptual issues. We will then review the limited experience with the measurement of caregiver-child feeding interactions, most of which is from observational studies. Finally, relevant results from our experience in measuring some of these concepts through survey methods in Accra (in the AUFNS study) will be summarized.

The Transactional Nature of Care

Characteristics of the child may have a major influence on a variety of caregiver behaviors. The child's age may influence behavior in a variety of ways linked both to the child's actual developmental stage and also to caregiver expectations for children of a given age. The child's gender may be an important determinant of caregiver behavior, particularly in some cultures. Age and gender are (relatively) easily determined in a research context, and have received attention. However, other less easily measured characteristics may also be important.

Children differ in respect to endowed healthiness, temperament, and social and language development. These characteristics may influence how actively and successfully the child "elicits" care, food, and attention. Caregivers' perceptions of the child's health, vulnerability, appetite, and growth may all influence care and feeding practices (Piwoz et al. 1994; Engle, Menon, and Haddad 1996; Engle, Lhotska, and Armstrong 1997). The transactional model of care suggests that a child's health, growth, and development all result from a long series of mutual interactions between the child and his/her caregivers. These interactions are influenced by a variety of characteristics of both the caregiver and the child, and change with the developmental status of the child.

In the context of care research, failure to recognize the role of child characteristics and the transactional nature of care can result in misinterpretations. For example, attempts to relate caregiver-feeding practices to child growth outcomes may be confounded by the child's (often unmeasured) level of appetite. Both positive practices such as encouraging the child to eat and negative overly controlling practices such as force-feeding may correlate with poor growth. However, this may be because both are methods that caregivers use in response to their perception of poor appetite.

Compensatory Versus Enhancement Care

A second and related discussion in the conceptual literature addresses the *meaning* of various care behaviors and differentiates between compensatory care—"behaviors intended to return the child to [an] … accepted state of health"—and

enhancement care—behaviors that "serve to enhance further development" (Engle 1992). Examples of compensatory care would include carrying a sick child or coaxing an anorectic child to eat. Examples of enhancement care would include interacting responsively with a toddler or encouraging a healthy child with a good appetite to eat a larger variety of foods. An enhancement orientation has been described as one result of the cultural transition that occurs with formal education of women and with a demographic transition towards smaller families (Zeitlin, Ghassemi, and Mansour 1990; Guldan et al. 1993a).

The distinction between compensatory care and enhancement care is related to the transactional nature of care. The motivation and meaning of a particular caregiver behavior vary depending on characteristics of the child. This is of importance in care research because once again the frequently unmeasured characteristics of the child (stage of development, level of health, activity, appetite, etc.) can act as confounders in efforts to relate caregiver behaviors to outcomes. For example, a simple look at the relationship between caregiver encouragement to eat and child weight-for-age can be confusing if child appetite is not taken into account. Active feeding may relate to both low weight-for-height—in which case it may represent compensatory care—and adequate or high weight-for-height—in which case it may represent enhancement care or even excessive urging. Conversely, leaving a child alone to eat and/or not actively encouraging the child may be problematic for young infants and for sickly children or children with chronic low appetite. For these children, lack of active feeding may represent a critical lack of compensatory care, whereas for a healthy three-year-old with a good appetite, it may not pose a problem. Thus it is possible to observe both low weight-for-height and adequate weight-for-height correlating with a lack of caregiver involvement in feeding. In a situation where compensatory care in feeding is observed (e.g., Bentley et al. 1991; Engle and Zeitlin 1996) and an enhancement orientation is rare, good practices can correlate with poor growth and health, while "poor" practices can correlate with good growth.

These issues are relevant for researchers because the transactional nature of care, the importance of child characteristics, and the differences between compensatory and enhancement care can all inform both research design and interpretation of results.

Level of Caregiver Control of Feeding and Child Anorexia

Maternal feeding styles vary widely between and even within cultures. In a series of reports from Mali,[15] and drawing on ethnographic literature from other settings, Dettwyler (1989a) has described a range of styles of feeding, and has argued that the level and nature of caregiver control of feeding may be as important as food availability or socioeconomic status in determining nutritional status. In a totally "laissez-faire" approach, young children and even older infants are allowed much autonomy in eating; they are assumed to know when they are hungry and when they are satiated. In this setting if a child refuses food, it is not considered necessary or appropriate to force or even to encourage her to eat. At the other end of the spectrum, extreme parental control of feeding may involve threats, bribes, or force-feeding. Somewhere in the middle of this spectrum, an optimal style of "responsive" feeding has been described (Birch and Fisher 1995).

Anorexia—the lack of a normal appetite, disinterest in food, or refusal to eat—has been reported among young children worldwide, even in situations where undernutrition is widespread. Anorexia may be chronic—as, for example, when caused by chronic malnutrition or subclinical infection, mineral deficiencies, or intestinal parasites—or it may be acute, as when caused by acute infections, sores in the mouth, or teething (Dettwyler 1989b; Golden and Golden 1991). Anorexia may also be classified as "non-

[15] See Dettwyler 1986, 1987, 1989a, 1989b, 1991, and 1992.

organic" in origin; "non-organic failure to thrive" (NOFTT) has been the subject of extensive investigations, almost exclusively in the developed country context.[16]

Results from several studies in developing countries suggest that caregivers respond to acute anorexia with a variety of efforts to encourage children to eat (Brown et al. 1988; Bentley et al. 1991; Almroth, Mohale, and Latham 1997). While this may seem obvious, these results contrast with a commonly held view that mothers withhold food from anorectic children during illness, and particularly during diarrhea (Chen 1983; Khan and Ahmad 1986; Kumar et al. 1985). Bentley and collaborators (1991) have also demonstrated that increased encouragement may occur when children are perceived as anorectic even in a setting where "laissez-faire" feeding is very common.

Dettwyler (1989b) documents the effects of anorexia on intake, and she discusses a range of possible causes of anorexia among young children. She describes the level of caregiver control of food consumption as mediating[17] between anorexia and intake, as illustrated in Figures 8 and 9. Figure 9 highlights the fact that even for children with severe problems of anorexia, parental help and control over feeding can mitigate the potentially detrimental effects of lack of appetite on growth. For children who do not experience frequent or chronic anorexia, parental involvement may not be as critical.

MEASUREMENT OF CAREGIVER-CHILD INTERACTIONS DURING FEEDING

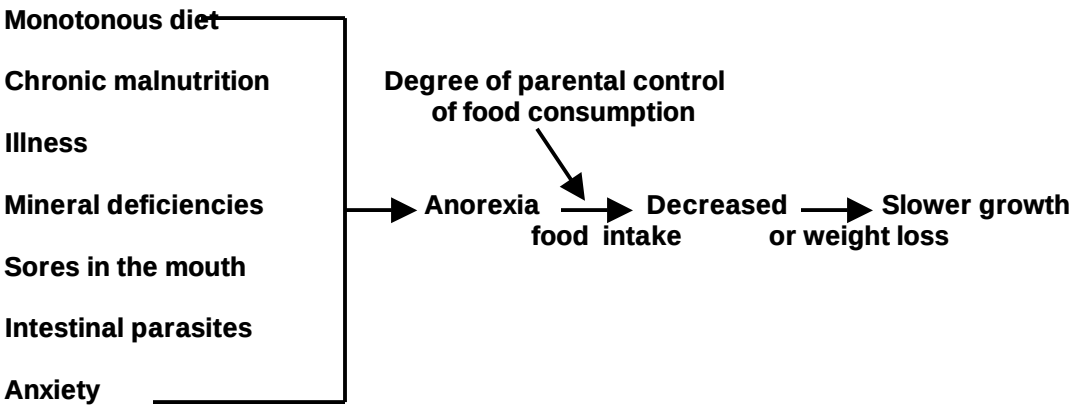
In the extended model of care described by Engle, Menon, and Haddad (1996), a set of constructs related to care during feeding is identified, along with preliminary suggestions for indicators. Key constructs at the caregiver level include:

---

[16] Review of the NOFTT literature is outside the scope of this report. Caution is required in extrapolating from the NOFTT literature to the developing country setting, where the majority of anorexia may be attributable to organic cause. However, the NOFTT literature does provide examples of tools developed and validated for the purposes of assessing caregiver-child interactions; some of these may be adaptable. For definitions and further information on NOFTT, see Homer and Ludwig 1981; Drotar 1991; Bithoney, Dubowitz and Egan 1992; Benoit 1993; Fomon and Wilson 1993; Frank, Silva, and Needlman 1993; and Chatoor et al. 1998.

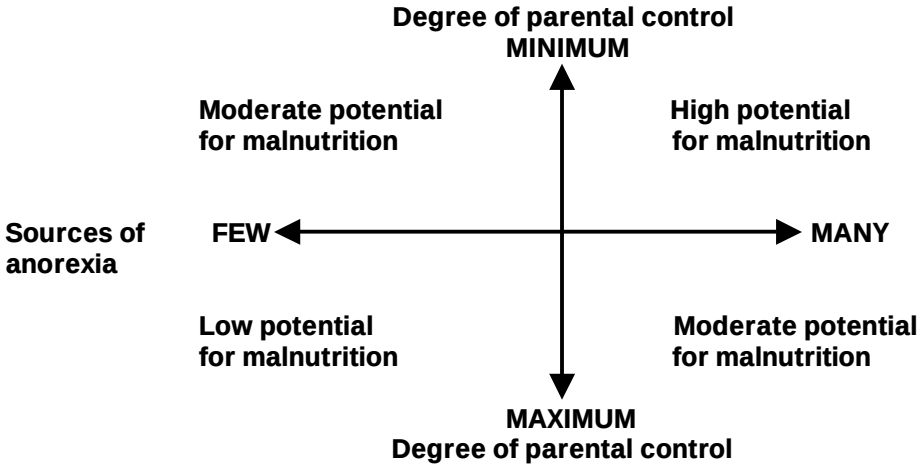
[17] In this model, the degree of parental control could also be conceived of as an "effect modifier", in the statistidal and epidemiological sense.

Figure 8—Causes of anorexia and the potential relationship between anorexia and growth



Source: from Dettwyler, 1989b, p. 693.

Figure 9—Potential for malnutrition under different combinations of sources of anorexia and degrees of parental control



Source: from Dettwyler, 1989b, p. 694.

- *Adaptation to the child's characteristics*: this includes adaptation to psychomotor abilities and physical difficulties (e.g., low birth weight babies with poor suckling ability).
- *Active and responsive feeding*: This refers to the caregiver's ability to feed responsively, including encouragement to eat, offering additional foods, providing second helpings, responding to poor appetite, and using a positive or aversive style of interaction; and
- *The feeding situation*: this includes location, organization, regularity, and frequency of feeding, supervision, and distraction during eating events.

At the child level, the importance of the following characteristics is also highlighted:

- Appetite and hunger;
- Food preferences;
- Child characteristics preferred (or not) by caregivers (e.g., gender, birth order).

For both caregiver practices and child-level variables, the indicators suggested by Engle, Menon, and Haddad (1996) are primarily derived from structured observations. To date, few researchers have used these methods to carefully examine these issues and to study the interrelationships between feeding style and situation, caregiver-child feeding interactions, and child appetite or demand for food. In the remainder of this section, we first summarize research employing structured observations to examine these related constructs, and then provide a short review of work employing other approaches. We conclude by describing results from our experience with a survey approach in Accra.

Structured Observations Methods

A summary of the design, hypotheses, methods and main findings of four studies that employed structured observations to describe various aspects of the context of

feeding and of caregiver-child feeding interactions is presented in Table 3. Because of differences in focus (age range, hypotheses) and methodology, the four studies cannot be directly compared. The studies also greatly differ in the types of indicators developed to measure feeding interactions in each context.

ACTIVE AND RESPONSIVE FEEDING AND CHILD DEMAND AND ACCEPTANCE OF FOOD

Scales to measure the constructs of "maternal encouragement to eat" and "child acceptance of food" were developed in the 12-month prospective study in Peru (Bentley et al. 1991). The study aimed at documenting whether "stages of illness" (diarrhea, convalescence, and health) affected maternal feeding behavior and child acceptance of food. Observation and analysis were at the level of each individual food or drink. The Encouragement to Eat scale consisted of "verbally encourage," "verbally pressure," and "physically force." The Child Acceptance of Food scale items were "rejects food," "appetite level," and "asks for food." The Child Acceptance of Food scale was validated against actual intakes, and showed a strong correlation (Spearman correlation = 0.47).[18]

A cross-tabulation of the two scales showed a negative relationship between child acceptance and maternal encouragement, suggesting compensatory care. The authors comment that mothers in this sample were "generally passive feeders," giving no encouragement to eat for 64 percent of all observations. However, more maternal encouragement to eat was observed during diarrhea than either during convalescence or health. Thus, it appeared that mothers in this setting were not withholding food during diarrhea, but on the contrary, they responded to anorexia with increased encouragement. Maternal encouragement was also greater with liquids and semi-solid foods than with solid foods.

As expected, child acceptance of food was higher during health than during diarrhea. Acceptance of liquids and semi-solid foods was higher than acceptance of

[18] The authors use "acceptance of food" and "appetite" interchangeably in this report.

Table 3—Summary of recent studies that have used observational methods to measure maternal-child feeding interactions and care during feeding

Authors/ Country	Type of study	Hypotheses	Observational Methods Used	Comments on Methodology	Summary of findings
Bentley et al. 1991 (Peru)	Dietary Management of Diarrhea Project (n = 40; 30-36 months old)	"Stage of illness" (diarrhea, convalescence, health) affects maternal feeding behavior and child acceptance of food.	12-hour structured observations over 2-4 days each of diarrhea, convalescence, and health. Observations took place over a 12-month period. Maternal feeding behavior and child acceptance of food were recorded at each meal (787 meals observed). Observations were at the level of the food or drink (951 observations) to allow assessment of variations in behavior by food type.	Performed a series of 3-hour observations without weighing children or food to assess reactivity of these procedures and of the more intrusive 12-hour observation. Report no difference in frequency or duration of breastfeeding between the 3-hour and the 12-hour observations. Identity of observer was not associated with maternal or child behavior.	➢ More maternal encouragement during diarrhea than during convalescence or health; also more encouragement with liquids and semi-solids than solid foods ➢ Child acceptance of food higher during health than diarrhea; also higher for liquids and semi-solids than solid foods, regardless of health status; breast milk intake negatively associated with child acceptance of food.
Engle and Zeitlin 1996 (Nicaragua)	Positive Deviance in Nutrition Research (n = 80; 12-19 months)	Caregiver encouragement to eat will be compensatory rather than enhancing; it will not be associated with anthropometry but will be associated with anorexia/food refusal. Child interest in food will be positively associated with anthropometric status.	Two 3-5 hour structured observations, approximately one week apart, during July-October, 1989. 37 behaviors were coded for each eating event. Eating events were coded as meals, snacks, or bottle-feeds.	Families did not have prior notice of the first visit. They knew the observer would return the next week, but not what day the observer would return.	➢ Active Feeding and Child Demand scales negatively correlated ➢ Active Feeding Scale not associated with child anthropometry ➢ Child Demand Scale positively associated with child anthropometry ➢ Maternal education not associated with either scale ➢ Results do not differ between mothers and other caregivers Child acceptance of food higher

(continued)

Authors/ Country	Type of study	Hypotheses	Observational Methods Used	Comments on Methodology	Summary of findings
Gittelsohn et al. 1998 (Nepal)	Case control study of previously xeropthalmic children 2-5 y and their younger siblings (n = 78 cases and 53 siblings + 78 age-matched controls and 53 siblings)	Caregiver-child behaviors directly influence and are influenced by how food is allocated within the household, and how the child is cared for in other ways. These behavioral patterns play a direct role in the health status of the child.	Seven day-long observations over a 15-month period, at 2-month intervals. Observers arrived early (6-7 am), took a midday break, and remained until after the evening meal. Observations were event-focused, with a minimum of one record per 5 minutes. 110 behavioral codes were developed.	Efforts to reduce reactivity included initiating observations only after households were very familiar with study personnel (after several contacts); using the same observer for each given household over the entire study period. In addition, reactivity was quantitatively assessed (see Gittelsohn et al. 1997). Each (blinded) observer was assigned an equal number of case and control households, to minimize effects of observer bias on case/control comparisons.	➢ Cases of xerophthalmia more likely to serve themselves and have more servings; twice as likely to be treated harshly; less likely to have health needs attended. ➢ Control children more likely to be served automatically ➢ Positive health behaviors associated with more encouragement to eat and more frequent offers of food ➢ Negative health behaviors towards child associated with more frequent request and more frequent refusals ➢ Children who refused food asked for food more frequently, for a longer time, and were less likely to self-serve. ➢ Children who served themselves received less encouragement to eat.
Guldan et al. 1993b (Bangladesh)	Positive Deviance in Nutrition Research (n = 185; 4-22 months at onset of study)	Maternal education will be independently associated with improved infant and child feeding practices (with SES controlled)*	45-minute structured observations, weekly for six months (Feb-July, 1986), for an average of 22 observations per focus child. Each possible combination of interviewer, time of day, and day of week was equally represented. Each observation period began with a “spot observation” of the conditions surrounding the child. The start of each clearly defined eating or breastfeeding activity triggered event recording (1,424 feeding and 1,914 breastfeeding observations).		➢ More educated mothers were more likely to feed child inside house than in courtyard, and to place child on a bed rather than on the ground; also more likely to notice when child dropped food; to feed child with cup (also with bottle); to terminate breastfeeds; and child was more likely to cry at end of breastfeeding. ➢ Mothers with no education more likely to engage in economic activities when breastfeeding; children more likely to initiate feeding and feed themselves; more likely to eat food not specifically prepared for them.

solids, regardless of health status. Breast milk intake was negatively associated with child acceptance of food, probably reflecting a compensatory behavior from the part of the child.

In their positive deviance study in Nicaragua, Engle and Zeitlin (1996) hypothesized, based on their previous work, that caregiver encouragement to eat would be compensatory in nature, and would therefore be associated with anorexia, but not with child growth indicators.

Eighty children aged 12-19 months were observed twice each over a four-month period. For each feeding event observed (snack, bottle-feed, or midday meal), 37 behaviors were coded. These included aspects related to the feeding situation, to the caregiver's feeding style and level and type of encouragement, and to the child's interest in eating. Two scales were developed for each meal type: an "Active Feeding Scale" and a "Child Demand Scale," yielding six scales in all. All items theoretically related were initially included in the scales, but based on reliability analysis, items were dropped in order to achieve the best possible reliability/consistency score (Cronbach's α).

The *Child Demand Scale* consisted of the same six items for meals, snacks, and bottle-feeds, with α ranging from 0.63 to 0.66, depending on the event. The items were: asks for food before given; interested in food at first; interested in food in middle; interested in food at end; asks for more food during meal; and more than one request before meal.

The *Active Feeding Scales* consisted of different items for meals than for snacks, and had low α's of 0.30 and 0.36, respectively. For bottle-feeds, there was only one item, "encourage," and thus no scale was constructed. Items common to the meal and snack Active Feeding Scales were: encourage; serves additional food; and offers additional food. Other items in the scale for meals were: threatens; demonstrates how to eat more; and orders child to eat more. Other items in the scale for snacks were: spoon used by caregiver; and talks to the child during eating.

Descriptive results indicate that as in the Peru study, mothers were observed to encourage their child during less than half of the eating events (39 percent). However,

this varied by event, with more encouragement observed during meals (59 percent) as compared to snacks (29 percent) or bottle-feeds (21 percent). The authors report “low levels of aversive control”; for example, threats were used in only 5 percent of eating events. Child demand for food was greater for bottle-feeds than for meals at all points in time. Child refusal at the end of the meal was common, with 65 percent of children not finishing the available food.

Also as documented in the Peru study, the two scales used in the Nicaragua study were negatively correlated. Evidence of compensatory care was confirmed by the lack of association between the Active Feeding Scale and children’s anthropometry. The Child Demand Scale, on the other hand, was significantly and positively associated with both higher weight-for-age and height-for-age.

The authors conclude that the child has a major role in determining intake, both through demand for food and through food refusal. While recognizing the need for further research, they state that because children are not eating all the food available to them, increased encouragement, particularly when children are not anorectic, might result in increased intake.

The Nepal study (Gittelsohn et al. 1998) was a case-control study of previously xerophthalmic children aged 2-5 years at the onset of the study, and their younger siblings. A large number of behaviors were observed and from these, a number of counts, scales, and scores were calculated. In general, these were calculated at the level of the observation day, and averaged across all days that a particular household was observed. This process resulted in a set of summary variables grouped as follows:

Caregiver-child feeding interaction: These included feeding style (e.g., caregiver serves automatically or child asks; second helpings; serving refusals); encouragement to eat (additive scale of 11 behaviors); child demand and interaction with caregiver (request intensity, time gap between request and service); snacking frequency; and meal frequency.

Intrahousehold food allocation patterns: meal serving order; channeling (proportion of foods served at meal that the index child was offered); shared plate (score summing number of times); inter-plate food sharing; number of people at meals where the child was served.

Four other childcare scales, not directly related to feeding, were also created: a positive social behavior scale (23 behaviors including affectionate gestures, holding, massaging, picking lice, cleaning, etc.); a negative social behavior scale (9 behaviors including scolding, slapping, hitting, refusing to give food, fighting, quarreling); a positive health behavior scale (15 behaviors including picking lice, brushing teeth, cleaning up feces in a sanitary manner, using soap to clean the child); and a negative health behavior scale (7 behaviors, including beating someone moderately or strongly, refusing requests for food in a discriminating fashion, injuries, and cleaning up feces in an unsanitary fashion).

Where Cronbach's α was reported for specific scales, it ranged from low (e.g., the negative social behavior scale with $\alpha = 0.39$, and the positive social behavior and positive health behavior with $\alpha = 0.56$) to "respectable" (an SES scale with $\alpha = 0.78$). Both "serving refusals" and "encouragement to eat" scales were reported to have very low reliability (αnot reported). The authors commented on the generally low reliability of the scales and suggested that the very low frequency of many of the observed behaviors contributed to the scales' low internal consistency. Despite limitations in reliability of some indicators, the results provide one of the richest available pictures of relationships between a variety of care practices. A key finding was that caregiver-child feeding behaviors and other childcare behaviors (health and social behaviors) were more important than intrahousehold food allocation behaviors in determining risk of xerophthalmia in this context. The authors state that observed relationships between feeding care and social and health care suggest that child neglect in one area of care (e.g., lack of automatic serving, more food refusal) is related to negative social and health-

related care. They call for further research exploring how these behaviors relate to various health outcomes.

An additional contribution of this study was the assessment of reactivity of the behaviors studied using two different approaches (Gittelsohn et al. 1997). The first method was to ask observers to code specific behaviors from household members such as whether they look at them, interact with them, or admit to modifying their behavior in the presence of observers. The second method was to examine changes in behaviors during the 7 repeated visits. Changes in behaviors can be interpreted as evidence of reactivity. There was some suggestion of reactivity, but patterns were inconsistent across different types of behaviors. Generally, a strong drop in reactivity was found after the first visit, lending the authors to suggest that it may be necessary to discard a first day's data, or to standardize it based on subsequent observations.

A study in Bangladesh (Guldan et al. 1993b) examined a variety of child feeding practices to determine which ones were associated with maternal education and whether the effect was independent from household socioeconomic factors. Structured observations of children aged 4-22 months at the outset of the study were carried out over a period of 6 months, leading to an average of 22 observations per child. Several types of summary measures for behaviors were calculated, including the percentage of observations in which a behavior was noted (e.g., the percent of observations of eating "events" in which the child was seated on the ground) and the average number of occurrences per hour (e.g., the average number of feedings per hour). Nine groups of variables were described, including both traditional child feeding practices (breastfeeding, complementary feeding) and behaviors related to caregiver-child interactions and feeding style (who initiates feeding, who terminates, identity of caregiver, feeding utensils used, feeding types per hour), and to the feeding situation (location, surface on which child is fed).

Maternal education was significantly associated with better feeding practices, and as stated by the authors, with greater "seriousness of attention" or "intentionality" in regard to child feeding. They note that the negative "modern" practice of bottle-feeding

also accompanied education, but state that on the whole, associations with education were positive.

Finally, an example from the United States of the measurement of maternal-child feeding interactions relates to the growing literature on parenting style, feeding interactions, and the risk of childhood obesity. While the objectives of the research and both cultural and resource differences may limit the relevance of study conclusions, it is possible that proven tools may be adaptable.

For example, Drucker et al. (1999) report excellent intra- and inter-observer reliability in their use of a scale quantifying parental eating prompts during a meal. This scale, developed by Klesges et al. (1983), is comprised of six scores, each of which is a simple count of the number of (1) physical encouragements; (2) physical discouragements; (3) verbal encouragements; (4) verbal discouragements; (5) the number of times food is presented; and (6) the number of times food is offered. Through observing one meal (in a laboratory setting), these researchers demonstrated strong significant relationships between the number of each type of maternal prompt and both the child's caloric intake and total mealtime. Their results suggest that ultimately, it may be possible to develop indicators relating to feeding interactions that are valid and yet involve shorter observation periods. However, skill requirements, and therefore training needs, remain on a very high level.

Summary conclusions regarding the use of structured observations to measure caregiver-child interactions during feeding:

- As in other areas of research, the use of structured observations in studies of caregiver-child feeding interactions is very resource intensive at all stages. For example, in the Nepal study with a sample size of 156 households, ten fieldworkers were trained for three months prior to the observational phase of the study. Data collection and analysis are also time-intensive and thus, costly.

- Structured observations of child feeding interactions have confirmed the relevance of the transactional model for investigating this area of childcare, and have provided rich information on care practices. This information, however, is highly context-specific, and tools need to be developed for each specific context.
- Taken together, several studies suggest the relevance of identifying constellations of good caregiver practices. In contrast to the situation with hygiene behavior research, however, there is no sense of convergence in the literature either in regard to methodology or in regard to identification of specific key practices.
- The limited available data on reliability of scales from field studies indicate the difficulties involved in operationalizing constructs such as "encouragement to eat" or "responsive feeding." More success has been achieved in operationalizing "child demand."
- Further research examining the reactivity and repeatability of measures would be useful; this could include re-analysis of existing data.
- Further research should also continue to explore the importance and the magnitude of the association between child-caregiver feeding interactions and child health and nutrition outcomes. This would help determine how crucial this information is for programs and whether continued research to develop simple measurement tools for measuring these concepts should be prioritized.

Other Measurement Approaches

Active and Responsive Feeding. Due to the nature of caregiver-child feeding interactions, ethnography and/or structured observation have generally been considered the methods of choice. Very few researchers have used interview approaches, instead of or in addition to observational approaches. A few exceptions exist such as the Nicaraguan study described above (Engle and Zeitlin 1996). In this study, structured observations were complemented by interviews where mothers were asked what they would do if their child refused to eat. The authors report that mothers who mentioned an action they would take (offer a different food, for example) were more likely to have well-nourished

children than were mothers who mentioned child-related reasons (e.g., child was ill, child did not like food) or those who felt there was nothing they could do. The association between mothers' response to this question and nutritional status remained when socioeconomic status and education were controlled for. The authors comment that a maternal attitude that something could be done about food refusal could be viewed as a proxy for "enhancement beliefs."

Merchant and Udipi (1997) also report interviewing mothers in their positive deviance study in Bombay using a semi-structured interview schedule covering a wide range of topics. In regard to feeding interactions, mothers were asked how the child was fed; five categories of feeding patterns were recorded: child feeds self without supervision or encouragement; eats from same plate as siblings; feeds self but supervised and encouraged; mother or grandmother feeds child; child is not served food.

The authors report large differences between the three groups in feeding patterns, with negative deviants being more likely to be unsupervised and more likely to eat from a shared plate. Positive deviants were much more likely to be fed by mothers or grandmothers. However, no mention was made of controlling for age in the analysis. Since younger children grow faster, are less likely to be underweight or stunted, and are more likely to be supervised or assisted, the differences observed might have been confounded by child age.

In summary, to our knowledge, very few attempts have been made to approach these issues using survey methods or other non-observational methods. Results from the Accra study using cross-sectional survey methods are described below (in Section 5).

Anorexia, Appetite, or Child Demand for Food. In contrast to the caregiver side of the feeding interaction, the "child demand" side has been examined in a number of research contexts, including iron and zinc supplementation trials, deworming projects,

food supplementation trials, studies of the effect of illness on dietary intake, and others.[19] Among older children and adults, a number of related variables—appetite, hunger, satiety, anorexia—have been assessed by self-report and/or by assessing food intake. Among younger children and infants, "appetite" is usually operationalized as food intake, and lack of appetite, or anorexia, is assessed through reported maternal perceptions. In both cases it is generally acute anorexia (or food refusal, or appetite, satiety, etc.) that is being measured; we have not found any validated tools for assessing longer-term tendencies towards good or poor appetite in children in developing country settings.

Dettwyler's ethnographic work in Mali (1989b) once again provides insights: she reports that mothers identified some children as "never having much of an appetite" while others were described as "liking to eat all the time." In addition, almost every child was reported to be anorectic at some time during the study, thus illustrating mothers' perceptions of both acute and "acute on chronic" anorexia. While some children were reported to be chronically poor eaters of all foods, others would refuse to eat particular foods only. Dettwyler did not explicitly address the issue of the validity of maternal perceptions of anorexia, but implicitly demonstrated the validity of these reports through her case study approach to growth patterns.

Brown et al. (1995) assessed the validity of maternal reports of acute anorexia. In a longitudinal study of infants in Peru, households were visited three times each week for a year. Morbidity data and maternal perceptions of appetite were gathered at each visit; mothers were asked to describe their infant's appetite as "the same as usual," "less than usual," or "more than usual." Dietary intake data were also obtained for a subsample of infants. Overall, mothers reported the child's appetite to be "less than usual" on 15 percent of days (this varied with age, ranging from 2 percent of days for infants less than one month old to 32 percent at 11 months of age). Maternal perceptions of low appetite were strongly related to reductions in nonbreast milk calories. Depending on the age of

[19] These include iron supplementation (Lawless et al. 1994); zinc supplementation (Krebs, Hambidge, and Walravens 1984; Umeta et al. 2000); deworming (Latham et al. 1990; Hadju et al. 1996); food supplementation (Zumrawi et al. 1981); relationship of illness to poor appetite (Brown et al. 1995; Gryboski 1996); relationship of appetite to growth indicators (Piwoz et al. 1994; Vazir, Naidu, and Vidyasagar 1998).

the child, calorie intakes from nonbreast milk sources were 25-35 percent lower on days when mothers reported poor appetite. Breast milk intake, however, declined only very slightly on poor appetite days (~ 5 percent) among infants 0-6 months of age, and did not decline among older infants.

Using data from the same study, Piwoz et al. (1994) demonstrate a relationship between maternal reports of poor appetite and lagging growth during infancy. Two subgroups of infants were identified; both subgroups showed slow weight gain from one to two months of age, but one subgroup (identified as positive deviants) achieved adequate weight-for-age by 12 months of age, while the other subgroup remained underweight. Comparing these two groups, prevalence of anorexia was higher in the poor growth group in each subsequent month up to 12 months.

Reports of poor appetite were 2-3 times more common on days when the child had diarrhea, and 4 times more common on days when the child had fever; 33 percent of diarrhea days were accompanied by anorexia, as were 45 percent of fever days. These results are similar to those reported from Java (Gryboski 1996), where lack of appetite was reported on 31 percent of diarrhea days and 60 percent of fever days. However, Brown and collaborators (1995) also reported that in their study in Peru, nearly one-third of all “new” episodes of anorexia were not associated with any symptoms. They indicated the need for further research on the factors other than symptomatic infections that influence appetite.

In a double-blind placebo-controlled zinc supplementation trial, Umeta et al. (2000) also used maternal reports of infant appetite. Mothers of 6-12 month-old infants were visited daily, and asked (1) if the child refused to breastfeed; (2) if the frequency, duration, or intensity of breastfeeding was reduced; or (3) if the frequency or amount of weaning food was reduced. Among children who were stunted at baseline, the authors report a significantly lower incidence of anorexia in children receiving the zinc supplement. This was consistent with significantly lower incidences of cough, diarrhea, fever, and vomiting, and with significantly greater gains in weight and height among

previously stunted infants supplemented with zinc, compared to the placebo-control group.

In summary, while only one study has explicitly addressed the validity of measuring maternal perceptions of acute poor appetite, the studies described above suggest that mothers' perceptions, operationalized in a variety of ways, relate meaningfully to other relevant indicators, such as caloric intake, a variety of symptoms, and growth.

Experience from the Accra Survey in Measuring Caregiver-Child Interactions During Feeding and Child Appetite

One objective of the Accra study was to explore the possibility of constructing simple indices for capturing important differences in caregiver behavior. While recognizing the limitations of survey approaches to the study of feeding interactions, it was nevertheless felt to be worthwhile to include a few simple questions relating to these interactions. The following questions were therefore included:

"Does anyone help the child to eat?" and "If so, who?"
"What does the caregiver do when the child refuses to eat?"

In addition, to capture the "child demand" side of the feeding interaction, a simple appetite visual analogue scale was used.[20] Mothers were shown a line 100 millimeters long with "Very Poor" at the left end, and "Very Good" at the right end, and were asked:

"How would you compare your child's appetite to that of other children of the same age?"

[20] Visual analogue scales have been validated for use by adults self-reporting hunger and satiety (Bergmann et al. 1992). As far as we know, no one has validated these scales when used for maternal reporting of a child's appetite.

Active and Responsive Feeding. Caregiver feeding practices—who helped the child eat and what was done about food refusal—were strongly related to the age of the child, as would be expected. Almost all infants (less than 12 months) were helped to eat by their "principal caregiver," and in almost all cases, this was their mother. While the proportion helped by others remained steady, the proportion of children who were not helped by anyone increased progressively with age. Problems with food refusal were less frequent among young infants, which was probably due to the fact that many of these young infants were not yet regularly receiving solid or semi-solid foods. Among children over 6 months, the proportion of caregivers using positive encouragement to eat (coaxing, playing, offering a different food) was slightly lower in the 6-12 month age group and remained fairly steady from 12-36 months, while the proportion of caregivers reporting that they force fed the child was highest in the 6-18 month age groups. Thus, feeding interactions clearly differed with the child's age.

Compensatory or Enhancing Care? Appetite scores were consistently lower among children who received some help with eating, which suggests some form of compensatory behavior.[21] It may be that children who are sicker and/or who have poorer appetite are more likely to be helped than healthier children.

The existence of compensatory behavior in this population was even clearer when examining the statistically significant association between appetite score quartiles and caregivers' response when the child refuses to eat (Table 4). Children with the lowest appetites were most likely to be force-fed, or looked at another way, 57 percent of force-fed children were found in the lowest appetite quartile. Among children with highest appetite analogue scores, one-quarter were reported to have no problem with food refusal, and another quarter were left alone when they refused to eat. On the other hand, when children in the highest appetite quartile did refuse food, about 70 percent of the mothers reported either encouraging (coaxing, playing, etc.) or force-feeding. Among all children,

[21] Mean appetite scores varied from 53 to 72 (depending on age) among children 12 months and older who received help, compared to 71-78 among those who ate by themselves.

but particularly among children in the lower appetite quartiles, those who were left alone when they refused food may be viewed as an "at risk" group; the severity of the risk would depend on the frequency, intensity, and duration of food refusal as well as other nutritional and health factors.

Feeding interactions and children's growth outcomes were also examined within 6-month age groupings, and no clear pattern emerged. This supports the hypothesis that feeding behaviors were compensatory in this population, at least to some extent.

Table 4—Appetite score quartiles and caregiver responses to food refusal (children 6-23.9 months old) (Accra study)

Caregiver responses to food refusal	Appetite score quartiles*			
	Lowest	2nd	3rd	Highest
Coax, play, change food	31%	51%	56%	39%
Force	31%	12%	6%	14%
Leave alone	28%	20%	14%	23%
Not a problem with my child	10%	17%	24%	25%

* Chi-square test ($p < 0.05$).

Child's appetite. Mothers' perceptions of their child's appetite also varied with the child's age, showing a "U"-shaped pattern. Higher appetite scores were reported for young infants whose diet was mainly breast milk (mean score of 75 among infants < 6 months of age), and also among children 24 months and older who were likely to have completed the transition period from breastfeeding to family foods. The lowest mean analogue scores were reported among children during this transition period, especially children between 6 and 12 months of age. This age (and up to 18-24 months) is also the period of highest prevalence of infectious diseases, which are known to markedly reduce appetite.

The intent of the question about appetite was to get information about the mothers' perception of their child's appetite as a chronic characteristic of the child. However, our analysis suggests that responses were probably influenced by recent illnesses, because the appetite scores were significantly associated with reported

symptoms of diarrhea, vomiting, and cough in the previous two weeks. To a certain extent, it is also possible that children with recent symptoms are also those who experience morbidity more often and thus have lower appetite on a more chronic basis.

The relationship between appetite scores and growth was explored by considering partial correlations between appetite and growth, controlling for the child's age. No clear pattern was observed with height-for-age, but a strong and statistically significant association was observed with weight-for-height Z-scores. Table 5 illustrates this relationship for children aged 6-36 months, and shows that almost twice as many children below the 25th percentile of weight-for-height were found to have low appetite (lowest appetite quartile), compared to children above the 75th percentile for weight-for-height. The fact that appetite scores were related to weight-for-height and not to height-for-age again raises the issue of the extent to which the analogue scores represent a chronic characteristic of the child as opposed to recent appetite, perhaps linked to illness. Suggestions for future refinements of this indicator are made below.

Table 5—Appetite analogue score quartiles and weight-for-height status (Accra study)

Weight-for-height status	Appetite score quartiles[a]			
	Lowest	**2nd**	**3rd**	**Highest**
Negative deviants (weight-for-height below the 25th percentile for this sample)	32%	26%	21%	16%
Median growers (weight-for-height between the 25-75th percentile for this sample)	50%	50%	55%	52%
Positive deviants (weight-for-height above the 75th percentile for this sample)	18%	24%	25%	32%

[a] Chi-square text for linearity ($p<0.05$).

Summary of the Accra study experience with survey approaches to measurement of feeding interactions. Survey approaches can never provide the richness and depth of data that may result from good observational studies. However, it appears that even

simple questions about feeding interactions can provide coherent information. In the Accra study, caregiver feeding practices (who helps the child and what is done about food refusal) were strongly related to the age of the child, as would be expected. These practices also related to maternal perceptions of the child's appetite, and may be interpreted to show some evidence of compensatory behavior.

In theory, relating appetite and caregiver responses to food refusal may allow some assessment of the degree of risk relating to low caregiver involvement in feeding. This cross-tabulation of appetite and caregiver actions may be seen as one way of operationalizing Dettwyler's conceptual model (1989b) relating anorexia, parental control of food consumption, and the potential for malnutrition (see Figure 9). However, it is important to note that our data do not show any association between reported caregiver responses to food refusal and growth, even among children with the lowest reported appetite scores. Theories concerning the role of encouragement to eat require further testing, with more refined measurement techniques, and ideally in longitudinal studies.

The validity of questions on feeding practices is hard to assess because, as with any survey question, it is impossible to determine whether responses reflect actual practices or whether they are influenced by the respondent's perception of a desirable response. This is most likely much less of an issue with these questions than with hygiene practice questions or even breastfeeding questions, as it is much less likely that caregivers have heard any messages from health "authorities" regarding these practices. However, it would be useful to have information both on the nature and strength of cultural norms regarding these aspects of feeding, as well as to have information on exposure to any public health work related to weaning foods.

The validity of the mothers' perception of appetite was suggested by the significant relationships found between the analogue and children's recent morbidity symptoms and growth (weight-for-height Z-scores). This indicates that the appetite analogue successfully captured at least some aspects of appetite. However, the relationship with morbidity symptoms and thinness also suggests that the analogue score

may be capturing recent appetite for some or all children, as opposed to good or poor appetite representing a more long-term characteristic of the child. Depending on the intent of the question—whether it is meant to reflect recent or long-term overall appetite, the formulation of the question can be further refined and fieldworkers trained accordingly.

Both the feeding practice variables and the appetite analogue ideally should be validated by triangulation with careful observational methods, where sufficient attention is paid to issues of reactivity and repeatability. In addition, the appetite analogue could be replaced with a short series of questions differentiating between the child' appetite over the long term, and recent or current appetite. Both indicators may also be modified and improved by more thorough grounding, which could be provided by a preliminary qualitative phase. Because these constructs were not central to the Accra study, they were not covered in the preliminary qualitative work, which focused on livelihood security for the urban poor.

Summary Conclusions Regarding the Use of Survey Approaches in Feeding Interaction Research

- Outside of observational studies, very few attempts have been made to study feeding interactions. It is probable that many aspects of these interactions will never be amenable to survey approaches; however, our experience suggests that simple questions can capture some aspects and deserve further research.
- In order to guide the design and interpretation of simple questions, rapid ethnographic work would be very useful. The use of qualitative methods, in a number of settings, may also help researchers determine if it is possible to identify a minimum set of key child feeding interaction variables that have universal relevance. At present this remains an open question.

- Once simple, well-grounded survey questions on feeding interactions are designed, triangulation could be achieved through structured observation of a subsample of households.
- Maternal perceptions of child appetite have been assessed in a number of research contexts; one study has validated these perceptions against the child's intake. Taken together, and using various specific indicators of the mothers' perceptions, these studies suggest that this is a useful approach to assessing acute appetite among children.
- The Accra study suggests that the simple visual analogue approach for maternal perception of appetite may be a useful tool; however, this tool needs to be refined to distinguish between perceptions of acute and chronic appetite, and it needs to be validated against intake in both cross-sectional and longitudinal studies. Care should be taken to assess whether the indicator is more or less valid depending on the education level of the mother.

6. IMPLICATIONS FOR THE MEASUREMENT OF CHILD FEEDING AND HYGIENE PRACTICES IN A PROGRAM CONTEXT

Our review has identified various key issues of relevance for programs in relation to the selection of indicators and approaches for the measurement of hygiene and child feeding practices. These issues are summarized below, and their implications for programs are discussed.

INDICATORS

The two essential characteristics of good indicators are their validity and reliability. For hygiene indicators measured through structured observations, Gorter and collaborators (1998) suggest a list of additional criteria, which also apply to indicators measured through spot-check observations. They suggest that, in addition to being valid and reliable, indicators should be

- Nonreactive (not affected by the presence of observers);
- Related to the outcome of interest;
- Representative of the range of practices in the particular context where they are used;
- Easily observed in most households (not hidden, and frequently performed, thus yielding limited missing data);
- Easy to standardize within and between observers (unambiguous, yielding limited inter-observer differences); and
- Variable between individuals or households in a particular context (i.e., the practice should not be uniformly performed in one single way, so that it can distinguish between individuals or households).

The characteristics described above also apply to other domains of behavior that may be measured through structured or spot-check observations, such as caregiver-child interactions during feeding.

For practices such as traditional feeding behaviors, which are usually measured through recall, the characteristics related to the ability to observe the practices obviously do not apply. In this case indicators must be free of recall bias, in addition to being valid and reliable.

The issues of validity, reliability, reactivity and recall bias and their relevance for programs are summarized below. In addition, we discuss the context-specific nature of these characteristics and the implications for the selection of indicators. Finally, we review the potential usefulness and limitations of creating composite indices for program monitoring and evaluation.

Validity, Reliability, and Reactivity

Validity and reliability are two characteristics universally recognized as essential for indicators to be useful in research, program, or policy analysis contexts. Our review showed that although many indicators have been used to measure hygiene and child

feeding practices, few have actually been tested for their validity and reliability. Significantly more research on these issues has been done in the area of hygiene practices compared to either traditional child feeding or feeding interaction behaviors.

At the individual level, both spot-check and structured observations of hygiene practices have shown problems of reliability (low repeatability), which are due to a combination of day-to-day variations and reactivity (changes in practices attributable to the presence of the observer). It is believed that spot-checks are less likely to be reactive than are structured observations, especially if families are unaware of the exact day and time the fieldworkers are visiting. Additionally, spot-checks can be performed relatively quickly and unobtrusively.

Spot-checks are, however, at least equally susceptible as structured observations to problems of day-to-day variability. The only study that examined reactivity and repeatability in spot-check observations did indeed show little evidence of reactivity, but significant day-to-day variability. Their comparison of observations on two separate days revealed significant differences in day-to-day variability between indicators (Gorter et al. 1998), resulting in a little over one-half of the indicators having good repeatability and the remaining having poor repeatability. These findings highlight the fact that reactivity and repeatability vary not only according to the methodological approach used (structured observations versus spot-checks), but also according to the specific practices observed. As will be discussed below, validity, reliability, and reactivity also vary between cultures and populations and thus must be assessed in different contexts.

Experience with the measurement of caregiver-child feeding interactions is at a much earlier stage of development than is the case with measurement of hygiene behaviors. Limited information on the reliability of the scales that have been used indicates greater success at this stage in operationalizing the “child demand” construct, than the “encouragement to eat” or “responsive feeding” constructs. Further research is clearly needed both to establish validity and to examine the reactivity and repeatability of indicators intended to capture these constructs.

Unfortunately, no rapid method of observation (such as the spot-checks) is available to collect information on caregiver-child feeding interactions. The only approach available to reduce observers' time and field costs is to visit households during a main meal. This is not always culturally acceptable and if appointments need to be made, reactivity problems may be intensified. Another alternative is to pursue attempts to develop methods based on caregivers' recall.

Recall Bias and Other Recall Errors

Recall bias is a critical methodological problem for data collected by recall. Bias is a systematic form of error, i.e., responses are systematically "biased'—inaccurate—in one particular direction. Recall bias often occurs as a result of a voluntary misreporting of practices when the interviewees are conscious of what the "correct" answer should be. This is analogous to the problem of reactivity in observational studies. Recall bias appears to be particularly severe for the reporting of hygiene behaviors, because most populations have at least a minimum knowledge and understanding of good hygiene practices. Studies that have systematically compared observed hygiene practices with recall information have demonstrated a strong bias towards the overreporting of better practices (e.g., Curtis et al. 1993; Stanton et al. 1987). The severity of the problem has caused researchers to strongly discourage the use of recall information for hygiene practices until improved approaches to questioning are identified and their validity is established (Curtis et al. 1993).

Post-intervention evaluations of education and behavior change projects are also particularly subject to this type of bias because people who have been exposed to the messages may feel pressured to report the practices they have been taught, irrespective of whether or not they have adopted them. The more successful the communication component of the project—particularly when not accompanied by a realistic, locally acceptable behavior change strategy, the bigger the potential problem with bias. This problem applies to any area of behavior for which education has been provided.

Another recall problem highlighted in this review is the differential length of recall between subjects, which becomes a problem when questions are asked retrospectively for events that occurred at different times prior to the interview. Recall error due to memory failure is of particular concern for questions about early child feeding practices (first 6 months), which are often asked of mothers of children of varying ages. Data from recall periods as long as 4 to 5 years are pooled together with data from much shorter recall periods (depending on the age of the child). When indicators require different length recalls from different respondents, the amount of error introduced is likely to be larger for the mothers of older children. Because the indicator is more "noisy" for older children (contains more error), estimates (e.g., of the prevalence of exclusive breastfeeding) will be much less precise. This, in turn, means that relationships between practices (e.g., breastfeeding) and outcomes (e.g., growth, health, etc.) will be difficult to detect, and that these relationships will be more difficult to detect among older children than among younger children, where recall error is generally smaller.

Depending on the objective of the survey, this type of error may be more or less problematic. Recall error will be most problematic for association studies because it will reduce the likelihood of detecting associations even when they exist. For example, it will affect studies trying to relate household (or individual) practices to child outcomes, or program exposure to changes in practices. Recall error, however, will not systematically bias prevalence estimates at the household level, although it will reduce their precision.

Although retrospective recall is almost the universal approach to collecting data on early child feeding, no study to our knowledge has specifically studied the magnitude and consequences of the recall problem. A rare reference to this issue was made by Dettwyler (1986), who noted during her longitudinal observational study of children in Mali that parental recall of the timing of introduction of solid foods in children's diet was not at all accurate. Longitudinal studies determining the magnitude of recall error for early feeding practices would be a very useful contribution, as they would clarify the practical implications of this type of error.

Recommendations for programs to address problems of random error (recall error and day-to-day variations in behavior)

Two approaches have been used to prevent the problem of differential length of recall. Recall error due to memory failure may be avoided either by collecting longitudinal data, or by restricting the recall to a narrower age range (e.g., getting recall only from mothers of infants). While this sounds simple and intuitive, longitudinal designs are expensive and rare. Obtaining a sufficiently large sample size in a narrow age range (e.g., infants) may also be challenging in the field. At the least, we recommend that an effort be made to restrict both the length of recall expected of respondents, and the variation in length of recall between respondents, to the greatest extent possible. This will have to be balanced against other sampling considerations. In addition, in some program contexts where monitoring data include household-level data—typically small, intensive interventions, it may be possible to collect data on key child-feeding events (such as the first introduction of liquids or solids) through routine monitoring.

In observational studies, the problem of normal (nonreactive) day-to-day variability in behaviors presents the same type of problem as random recall error in surveys. That is, day-to-day variability makes indicators more "noisy" and less precise. As noted above, depending on the objective of the data collection, this may not be terribly problematic. In contexts where only population-level estimates of prevalence are needed—for example, in many pre- and post-intervention surveys, random day-to-day variability may not be a concern. "Noisy" indicators may require larger sample sizes, but they do not introduce a systematic bias. Also as noted above, for individual- or household-level risk assessment, or for relating program "exposure" to changes in practices, day-to-day variability will undermine efforts to detect relationships.

Recommendations for programs to address problems of reactivity and recall bias

Unlike day-to-day variability and random recall error, both reactivity and recall *bias*—systematic changes in behavior or responses due to perceptions of what the observer/interviewer views as good—present problems in almost all measurement

contexts. Although problems of reactivity and recall bias are difficult to eliminate, some approaches can help minimize their impact on the quality of the information. For instance, in order to minimize reactivity, it is recommended that survey teams refrain from informing households of the exact day and time the observers will visit them. Some study teams, for example, inform families that observers will visit them during a particular week, but the exact time and date are not specified. This may help reduce the problem of households making “preparations” for the visit, and thus may help reduce reactivity.

Another approach that has been used in some studies is to describe the objectives of the observation in relatively general terms (such as “to observe aspects related to child health”) rather than providing details about the specific hygiene or feeding practices being observed. This may also help reduce reactivity, but ethical issues related to this approach have to be dealt with carefully.

Reactivity is likely to be a particularly severe problem in the context of evaluations of nutrition education and behavior change interventions. This was mentioned above in relation to methods that use recall techniques, but is also true for observations. Once people have been exposed to education messages, they are more knowledgeable and aware of how they are expected to behave or respond. There is no real solution to this problem, unfortunately, but there are a few methods that can be used to help minimize reactivity in these circumstances.

One approach is to ensure that the staff who carry out the observations or interviews (i.e., the evaluation team) is different from the team responsible for the education intervention. It is important that families dissociate the research process from the intervention. When possible, another approach is to try to include some checks when fieldworkers carry out the observations or interviews. For example, if mothers have been taught to use diapers or a cloth for their child, the observer can systematically try to observe whether there is more than one diaper around. In exclusive breastfeeding promotion programs, interviewers can be trained to observe the presence of baby bottles or breast milk substitutes in the house. Supplementary observations such as those we

have just described represent one form of triangulation. The use of mixed methods, with the potential for triangulation, is discussed below. These are certainly imperfect solutions to the possibly severe problem of biased responses in evaluations of behavior change interventions; at the least, these approaches may help researchers gauge the extent of the problem and may aid in interpretation.

Finally, the literature on hygiene practices using observational methods (structured or spot-checks) has shown that reactivity tends to decrease over time, so repeated observations are recommended. Gittelsohn and collaborators (1998) even suggest that it may be necessary to discard a first day's data, or to standardize it based on subsequent observations. Repeated observations are also recommended to address problems of day-to-day variability, particularly when investigations aim to assess individual- or household-level causal associations.

Context-Specificity

Our review highlighted the fact that the validity, reliability, and reactivity of indicators are context specific. Thus, when selecting indicators, it is not sufficient to rely on previous studies carried out in other contexts, because the key characteristics of the indicators may vary from one population to the other. An example of differences in reactivity was provided by the two observational studies of hygiene behaviors reviewed. In Burkina Faso, disposal of children's stools was not found to be reactive—e.g., there was no significant variation in this practice between two visits (Cousens et al. 1996). In Nicaragua, on the other hand, stools were less likely to be disposed of on the second observational visit (77 percent versus 91 percent on the first visit), showing evidence of reactivity (Gorter et al. 1998).

Other characteristics of indicators such as whether they can be easily observed were also found to differ between study contexts. For example, the presence of human feces on the compound was not useful in our Accra study because it was observed too infrequently (Armar-Klemesu et al. 2000). In Nigeria, however, Omotade and collaborators (1995) reported observing feces near the house in 10 percent of peri-urban

compounds and 25 percent of rural compounds, making it a potentially discriminating variable. Similarly, cleanliness of the floor inside the house in the Accra study was unobservable by spot-checks in one-half of the households because fieldworkers were not invited inside the house. In Nicaragua, on the other hand, the condition of floor surfaces was an easily observed and discriminating indicator (Gorter et al. 1998),

The choice of approaches (observations, spot-checks, recall) should also be guided by the characteristics of the population where they will be used. For example, in areas such as many urban centers where families are often unwilling to let observers inside their house, recall methods may have to be used to collect information on characteristics that would require observers to see inside the house. If reactivity is known to be a particularly severe problem in some populations, spot-check methods may be more suitable in this context, in spite of other potential limitations they may have. The same is true for recall methods, which may be more likely to be affected by recall biases in some cultures than in others. Differences in education levels, for example, often affect respondents' recall abilities, or their skills in falsifying information.

Thus, both the choice of approaches and of indicators to use for the measurement of behaviors must be guided by in-depth knowledge of the culture and population where the study is to be carried out. Validity, reliability, and reactivity studies in a wider range of contexts than presently available would be particularly helpful to identify commonalities and differences between contexts and to help define areas of consensus on at least some of the methodological challenges we are currently facing in the measurement of behaviors.

The Potential and Limitations of Indices for Program Monitoring and Evaluation

As described in this review, there are various reasons why composite indices may be useful for specific purposes. Indices are likely to be particularly helpful in instances where practices are found to cluster, or where a minimum number of good practices are necessary for a significant impact to be achieved. Using indices, it is possible to combine multiple dimensions of a concept, and to handle behaviors that are age-specific, such as

child feeding practices. Conversely, the main disadvantage of indices is that they hide the specific practices that they include. While this does not constitute a problem for some particular applications, it does limit interpretation for others.

Composite indices are unlikely to be useful for program monitoring. The main purpose of monitoring is to collect and review information on project implementation (activities, coverage, and use), which can be used to redesign or reorient the program and to strengthen its implementation and the quality of service delivery in an ongoing fashion (Habicht 1996; Levinson et al. 1999). For this purpose, clear and simple process indicators that can be easily measured and interpreted are required. Composite indices do not meet these criteria. However, when interim measures of program impact are needed—sometimes referred to as *performance monitoring*, indices may be useful, as described below in the context of evaluations.

For evaluation purposes, there are advantages and disadvantages to using composite indices. The potential disadvantages are twofold. First, indices do require some additional data processing capability compared with simple variables. This capacity does not always exist in a program context. Second, indices imply the construction of one single variable, which represents a concept or various dimensions of a concept. While this is the main purpose of creating the index, it may not be appropriate for some applications. Take, for example, a program aimed at the promotion of exclusive breastfeeding, and the use of the child feeding index we created with the DHS data to evaluate its impact. As currently designed, breastfeeding practices are but one of various dimensions of child feeding practices included in the index. It is thus likely that even if exclusive breastfeeding had improved over time as a result of the intervention, the index would not be sensitive enough to detect changes unless they were very large. This is because measurement of the other dimensions included in the index, which are unlikely to have changed, would decrease the overall change in the index. In this case, a more sensitive indicator to evaluate impact would be one that focuses specifically on assessing exclusive breastfeeding practices.

Composite indices, on the other hand, may be useful for the evaluation of other types of interventions, especially those that target a package of behaviors to be modified. Variables to include in the index should be selected based on the behaviors targeted by the intervention. With this approach, the global impact of the intervention on practices could be assessed. In addition, creating the index does not exclude the possibility of examining the impact of the intervention on individual practices as well. The main advantage of using an index in this context is that it allows assessment of the impact of the program with one single indicator. The index also may be used in bivariate or multivariate analyses looking at the association between practices and outcomes, or alternatively, it may be used to study the determinants of changes in behaviors.

As highlighted throughout this report, the selection of variables to be included in the index should also be context-specific. This was clearly reflected in the creation of the hygiene index using data from the Accra study. Four variables had to be eliminated from the index, three of them because they could not be observed in many households (and thus yielded too many missing values) and one variable because the practice was uniformly positive (it lacked variability). The reliability of the index should also be tested in the context in which it is used and it should be validated or triangulated against other indicators whenever possible.

METHODS

Mixed Methods

The potential usefulness of mixed methods was a recurrent theme in the literature reviewed on hygiene and child feeding behaviors. A variety of qualitative and quantitative methods may be employed, including an array of rapid and/or participatory techniques (e.g., focus groups, structured and unstructured key informant interviews, community meetings), structured and unstructured observations, spot-checks, and various types of surveys. Each approach has its strengths and weaknesses; the use of mixed methods takes full advantage of complementary approaches, and allows triangulation of

findings. The use of mixed methods can also allow the validation of new tools and the development of simplified data collection tools.

All methods require careful training, but observational approaches are particularly intensive in this regard, because they often involve making subjective judgments. Fieldworkers must therefore be standardized to minimize both intra- and inter-observer biases. Appropriate levels of standardization are usually achieved more rapidly with recall methods, especially when they rely on simple, well-formulated, and culturally sound questions and pre-coded answers. In terms of fieldworker time and related field costs, spot-check observations are a rapid and economic alternative to structured observations. Spot-checks, however, are not suitable to assess all types of behaviors and would probably not be appropriate for gathering information on child feeding and other care practices.

The importance of qualitative work prior to the design of interventions and the selection of indicators has also been emphasized throughout this review. Methods such as focus groups and various types of selective interviewing have been widely used in the program design phase. Box 1 provides an example, in the domain of caregiver-child feeding interactions, of the types of questions that might be explored using rapid qualitative methods.

Two other promising and recently developed approaches to assist in program design—consultative research and positive deviance inquiry—are briefly summarized in the next sections. Both of these approaches emphasize explicit community involvement in intervention design.

Consultative Research

Consultative research is an approach that has been developed to design effective programs to improve infant and young child feeding practices (Dickin, Griffiths, and Piwoz 1997; Favin and Baume 1996). The approach has also been used in diarrheal disease control programs (Griffiths et al. 1988), in hygiene promotion programs (Curtis et

Box 1: Exploring caregiver-child feeding interactions

(Examples of questions that might be explored using rapid qualitative methods)

Helping children eat

- When do babies and children need help with eating? At what ages? With what foods?
- What kinds of help? Who helps them? Who should help them?
- Who eats with children? Should children eat alone?

Eating arrangements

- When, where, and how often do children eat? How often should they eat?
- How is food served? Who shares a plate?
- How do mothers and other caregivers think about meals versus snacks?

Poor appetite

- What does it mean when a child refuses food?
- Do caregivers recognize poor appetite? How do they recognize it?
- How do they describe it? With what do they associate poor appetite?
- Do they view it as a problem?
- Do they view it as a (chronic) characteristic of some children?

Control of eating

- What do they do when children refuse to eat when they are sick? When they are not sick?
- What do they do if the child eats only a little, or only drinks?
- Should children ask for food? At what ages? What happens when they ask for food?

General questions:

- What do they think the "best" mothers do? (This question could follow a number of the others)
- Do answers to these questions vary between education/ethnic/income groups, or between generations?

al. 1997) and in programs to promote increased intake of vitamin-A rich foods (HKI, undated; Smitasiri et al. 1993).

The consultative research methodology is based on the premise that community programs will be more effective in modifying child feeding practices and in improving child nutrition if communities are directly involved in their design and formulation. The methodology is largely based on qualitative methods adapted from anthropology, market research, and nutrition, which may be complemented by some semi-quantitative or quantitative methods as appropriate. The ultimate objective is to understand "what people say, believe, do, and want to do" (Dickin, Griffiths, and Piwoz 1997, p. 1). The methodology involves the following steps:

- Define the key problems and practices;
- Identify simple and effective actions within the household;
- Test the recommended practices in the homes to determine which ones are most practical and culturally acceptable;
- Develop an effective strategy for the promotion of the selected practices among the targeted population.

Thus, consultative research is specifically designed to yield insights into the behaviors, practices, cultural characteristics, and constraints to behavior change faced by a population (Dickin, Griffiths, and Piwoz 1997), and to include these considerations in formulating successful programs.

Experience already exists in the use of consultative research to design programs targeting the categories of behaviors addressed in the present review. Thus, it should be possible to continue to promote the use and adaptation of this approach. However, more emphasis should be put on including concerns related to the selection of appropriate indicators for monitoring and evaluation during the formative/design phase.

Positive Deviance Inquiry

The context in which the "positive deviance" approach was developed, as well as the link between positive deviance and the concept of care, are described in Section 2 of this report. Although the positive deviance approach was initially used mainly for research purposes, it has become increasingly popular in the area of action research and program design and implementation. Various nongovernmental organizations, as well as USAID-funded programs such as Linkages and BASICS, have recently experimented with including positive deviance inquiry as part of their program development process.

In the Hearth Nutrition Model (Wollinka et al. 1997), the positive deviance approach is used for two different purposes. First, it is used as an approach to identify the parental and community characteristics and resources that distinguish between children who grow well and those who grow poorly, in spite of sharing similarly impoverished

socioeconomic conditions. Second, it is used as a communication tool to convince mothers of malnourished children that affordable solutions exist within their community. The power of locally discovered and demonstrated solutions is well recognized in behavior change interventions. In all program applications, the ultimate goal of using the positive deviance approach is to improve the effectiveness and impact of behavior change interventions by identifying locally available solutions and resources to improve children's nutrition. According to available documents describing the use of the positive deviance approach for program design and planning, the experience appears to have been generally positive and encouraging.

It may be necessary at this stage, however, to mention a few words of caution about the use of the methodology. First, many of the reports available on the use of the methodology do not pay sufficient attention to the matching of children on age and on socioeconomic status. In impoverished environments, children's growth deteriorates rapidly with age, often almost linearly from birth to 18-24 months of age (Ruel 2001), after which age it tends to stabilize at low levels. If "positive" and "negative" deviants are identified without being matched on age within relatively small age intervals (3-6 months, for example), it is likely that a key explanatory factor for differences between the two groups is age, rather than specific feeding or care practices. In a positive deviance study in Ethiopia (Green Abate, undated), for example, positive deviants had an average age of 34 months, compared to the negative deviants who were, on average, 21 months. It is likely that the poorer nutritional status of the latter group was, at least in part, due to higher rates of infectious diseases, which are typically more prevalent during the second compared to the third year of life (Ruel 2001). Thus, positive deviance studies should either be restricted to children within a relatively small age range, or children should be matched on age. Children should also be matched on socioeconomic status to respect the underlying principle that positive deviants are children who grow well in spite of living in impoverished environments where poor growth is the norm.

Another issue of importance for programs relates to findings from a positive deviance research analysis of the Tamil Nadu Integrated Nutrition Project. The study

showed that the behaviors that distinguished positive deviants from “median growers” were not mere opposites of behaviors that distinguished negative deviants from median growers (Shekar, Habicht, and Latham 1991). For example, lower intake of pulses differentiated negative deviants from median growers, but did not differentiate median growers from positive deviants. The implications of these findings for programs are that the behaviors that are associated with positive deviance may not always be the same behaviors that will protect children from the worst outcomes (becoming a “negative deviant”). Using feeding interactions as an example, it is possible to imagine an environment where active feeding could protect the most vulnerable children (sick, anorectic, and/or already marginally malnourished) from the worst growth and nutrition outcomes. However, if active feeding was critical for only a subset of children, it is possible that this relationship would be masked when looking for an overall correlation with outcomes and/or when looking for the correlates of positive deviance. Relatedly, some applications of the method have limited the inquiry to positive deviant children or households, without verifying if the positive deviant practices identified are, in fact, systematically absent in negative deviant households.

In conclusion, the positive deviance approach for program planning seems to be popular, feasible, and generally successful. It is important, however, not to forget the fundamental concepts of the approach when applying it, so that its real potential can be achieved.

CONCLUSIONS

This review argues that a variety of useful indicators and approaches exist for the assessment of hygiene, child feeding, and caregiver-child interaction behaviors. The strengths or weaknesses of these methods and indicators are discussed and the need to adapt them to local contexts is highlighted. In conclusion, we present recommendations for programs in five areas: formative research; mixed methods; hygiene practices measurements; measurements of traditional child feeding practices; and measurement of feeding interactions.

- Program planning and design should be accompanied by some form of qualitative research, even if it is relatively rapid and simple. At a minimum, basic information should be collected on:
    - locally specific aspects of the practices of interest (e.g., when and how do people wash their hands?);
    - the importance and meaning of these practices in this context (e.g., are there strong norms surrounding certain behaviors? Are there local conceptions of "ideal" behaviors?);
    - whether or not the practices are observable;
    - whether or not they are likely to be reactive (or prone to recall bias);
    - whether they vary within the population, and how (by age, education, ethnicity, etc.); and
    - how amenable to change the key practices appear to be.

  This information will be invaluable for selecting the behaviors to be targeted, for designing the implementation strategy, and for selecting suitable indicators and methods for monitoring and evaluation in different contexts. Consultative research and positive deviance inquiry are two useful approaches that have been successfully used for these purposes.
- Mixed methods are recommended both in the planning stage and in the monitoring and evaluation stages. They are particularly useful in that they may allow for triangulation of findings and for validation of indicators.
- *In the area of hygiene practices*, the use of recall methods is discouraged because responses have been shown to be biased towards overreporting of good practices. The spot-check method is a promising alternative to structured observations because it is much less time consuming and costly, and also appears to be less reactive. Day-to-day variability affects the reliability of both spot-checks and structured observations; the best solution is to repeat the observations. Examples of indicators that have been used in spot-check observations are available in this review and can be used to guide the development of similar observation tools in

other contexts. Careful training and standardization of fieldworkers is required for all observational methods, including spot-checks.

- *In the area of traditional child feeding practices*, recall methods have been popular, but they have not been validated. Recall methods are subject to biases, including both memory failure and the overreporting of good practices. The latter is especially true when recall methods are used for evaluating education interventions. The problem of memory failure may be overcome by limiting the time gap between the behavior and the recall, either through narrowing the age range—for example, only interviewing mothers of infants about breastfeeding and complementary feeding—or through longitudinal designs. One approach to reducing the overreporting of good practices is to dissociate the program implementation and the evaluation processes and to use two different teams of fieldworkers. An example of a well-designed, widely available questionnaire for collecting data on traditional child feeding practices can be found in the KPC2000 (Knowledge, Practices and Coverage (www.childsurvival.com/kpc2000) breastfeeding and infant/child nutrition module. Care should be taken to adapt the formulation of the questions and the specific food groupings (for the food frequency and dietary diversity recalls) to the context where they are being used. Additional information on methods for collecting data on dietary intakes (either by 24-hour recall or food frequency questionnaires) is widely available in the literature.
- *In the area of caregiver-child interactions during feeding,* knowledge from research is not sufficiently advanced to allow us to recommend specific indicators at this stage. Structured observations continue to be the method of choice for documenting these interactions, and various measurement scales have been developed. However, most of these tools have not been validated. Experience with measuring caregiver-child interactions through survey methods is extremely scanty, and the potential of interview methods to collect information in this area appears limited. The exception to this is the construct of child appetite; while

additional work is needed, based on available evidence it seems likely that maternal perceptions of a child's appetite are closely linked to intake in the short term; in addition, the simple visual analogue scales for the measurement of appetite have been used successfully and should be validated in the future.

APPENDIXES

APPENDIX 1

Practices and Scoring System Used, by Age Group, to Create the Care Index (Child Feeding and Use of Preventive Health Services), Accra Study, 1997

Practices included in the index		Scores allocated, by age group (months)		
Breastfeeding and feeding practices	**Results**	**4-8.9**	**9-17.9**	**≥ 18**
Prelacteal feeds used	Yes: 33%	Yes:-1 No: 0	Yes:-1 No: 0	Yes:-1 No: 0
Still breastfeeding	Yes: 51%	No =-1 Yes = 1	No = 0 Yes = 1	
Gave to child when he/she was 0-4 months old:				
- Water	Yes: 69%	Yes:-1 No: 0	Yes:-1 No: 0	Yes:-1 No: 0
- Sugar-based liquids	Yes: 26%	Yes:-1 No: 0	Yes:-1 No: 0	Yes:-1 No: 0
- Infant formula	Yes: 32%	Yes:-1 No: 0	Yes:-1 No: 0	Yes:-1 No: 0
- Cow milk	Yes: 17%	Yes:-1 No: 0	Yes:-1 No: 0	Yes:-1 No: 0
- Solid foods	Yes = 58%	Yes:-1 No: 0	Yes:-1 No: 0	Yes:-1 No: 0
First food offered to child	a)Unfortified cereals (koko): 60% b)Fortified cereals: 30% c)Nothing special: 10%	a) 0 b) +1 c) -1	a) 0 b) +1 c) -1	a) 0 b) +1 c) -1
Does anyone help the child eat	No: 28%		No: -1 Yes: 0	No: -1 Yes: 0
What does caregiver do when child refuses to eat	a) Nothing (child left alone): 21% b) Other (coax, play with, force, change food, not a problem): 79%	a) -1 b) 0	a) -1 b) 0	a) -1 b) 0
Preventive health care services use				
Growth monitoring (past month)	Yes: 63%	No: -1 Yes: 0	No: -1 Yes: 0	No: -1 Yes: 0
DPT immunization (> 3 mo)	Yes: 91%	No: -1 Yes: 0		
Measles immunization (> 9 mo)	Yes: 85%		No: -1 Yes: 0	No: -1 Yes: 0

APPENDIX 2

Variables and Scoring System Used to Create the Child Feeding Index for Infants 0-6 Months Old (Demographic and Health Surveys)

Variable	***Coding***
Currently breastfeeding	No = -1; Yes = +1
Timing of breastfeeding initiation	0-0.9 h = +2 1-1.9 h = +1 3-5.9 h = 0 ≥ 6 h = -1
Uses baby bottles	No = +1 Yes = -1
In the past 24 hours gave: - Nonmilk liquids	No = 0 Yes = -1
- Nonbreast milk	No = 0 Yes = -1
- Other liquids, semi-liquids, solids	No = 0 Yes = -1
Maximum/minimum	**+ 4 / -6**

APPENDIX 3

Variables and Scoring System Used to Create the Child Feeding Index for Children 6-36 Months, by Age Group (Demographic and Health Surveys)

Variables	6-9 months	9-12 months	12-36 months
Breastfeeding	No = 0; Yes = +1	No = 0; Yes = +1	No = 0; Yes = +1
Use bottle	No = 0; Yes = -1	No = 0; Yes = -1	No = 0; Yes = -1
Dietary diversity (in past 24 hours)	**Sum of:** (grains + tubers + milk + other foods): 0 = -1 1-2 = 0 3-4 = +1	**Sum of:** (grains + tubers + milk + other + eggs/fish/poultry): 0 = -1 1-3 = 0 4-5 = +1	**Sum of:** (grains + tubers + milk + other + eggs/fish/pooultry + meat): 0 = -1 1-3 = 0 4-6 = +1
Food frequency (past 7 days)	**For each of:** - **carbohydrates (grains + tubers)** - **milk** 0 times in past 7 d = -1 1-3 times in past 7 d = 0 4 times in past 7 d = +1 **Food frequency** = sum of scores for carbo + milk **1 Bonus point each,** if consumed: - meat (once or more times) - eggs/fish/poultry (once or more)	**For each of:** - **carbohydrates** - **milk** - **eggs/fish/poultry** 0 times in past 7 d = -1 1-3 times in past 7 d = 0 4 times in past 7 d = +1 **Food frequency** = sum of scores for carbo + milk + eggs/fish/poultry **1 Bonus point** if consumed: - meat (once or more times)	**For each of:** - **carbohydrates** - **milk** - **eggs/fish** - **meat** 0 times in past 7 d = -1 1-3 times in past 7 d = 0 4 times in past 7 d = +1 **Food frequency** = sum of scores for carbo + milk + eggs/fish/poultry + meat
Meal frequency **(past 24 hrs)**	0 meals/d = -1 1 meal/d= 0 2 meals/d = +1	0 meals/d = -1 1-2 meals/d = 0 3+ meals/d = +1	0—1 meal/d = -1 2-3 meals/d = 0 4+ meals/d = +1
Maximum/minimum	**+8/-5**	**+8/-6**	**+8/-7**

REFERENCES

Aboud FE, Alemu T (1995) Nutrition, maternal responsiveness and mental development of Ethiopian children. *Social Science and Medicine* 41: 725-732

Ahmed NU, Zeitlin MF, Beiser AS, Super CM, Gershoff SN (1993) A longitudinal study of the impact of behavioral change intervention on cleanliness, diarrhoeal morbidity and growth of children in rural Bangladesh. *Social Science and Medicine* 37: 159-171

Alam N, Wojtyniak B, Henry FJ, Rahaman MM (1989) Mothers' personal and domestic hygiene and diarrhoea incidence in young children in rural Bangladesh. *International Journal of Epidemiology* 18: 242-247

Alam N, Wai L (1991) Importance of age in evaluating effects of maternal and domestic hygiene practices on diarrhoea in rural Bangladeshi children. *Journal of Diarrhoeal Diseases Research* 9: 104-110

Almedom AM (1996) Recent developments in hygiene behaviour research: An emphasis on methods and meaning. *Tropical Medicine and International Health* 1: 171-182

Almroth S, Mohale M, Latham M (1997) Grandma ahead of her time: Traditional ways of diarrhoea management in Lesotho. *Journal of Diarrhoeal Diseases Research* 15: 167-172

Armar-Klemesu M, Ruel M (2000) A positive deviance approach to studying child feeding practices and care in Accra, Ghana. Report submitted to the Food and Nutrition Technical Assistance Project (FANTA). International Food Policy Research Institute, Washington, D.C.

Armar-Klemesu M, Ruel M, Maxwell D, Levin C, Morris S (2000) Poor maternal schooling is the main constraint to good childcare practices in Accra. *Journal of Nutrition* 130: 1597-1607

Aulia H, Surapaty SC, Bahar E, Susanto TA, Roisuddin, Hamzah M, Ismail R (1994) Personal and domestic hygiene and its relationship to the incidence of diarrhoea in south Sumatera. *Journal of Diarrhoeal Disease Research* 12: 42-48

Bartlett AV, Hurtado E, Schroeder DG, Mendez H (1992) Association of indicators of hygiene behavior with persistent diarrhea of young children. *Acta Paediatrica* 381 (supplement): 66-71

Benoit D (1993) Phenomenology and the treatment of failure to thrive. *Child Adolesc Psychiatr Clin North Am* 2: 61-73

Bentley M, Stallings R, Fukumoto M, Elder J (1991) Maternal feeding behavior and child acceptance of food during diarrhea, convalescence, and health in the central sierra of Peru. *American Journal of Public Health* 81: 43-47

Bergmann JF, Chassany O, Petit A, Triki R, Caulin C, Segrestaa JM (1992) Correlation between echographic gastric emptying and appetite: Influence of psyllium. *Gut* 33: 1042-1043

Birch L, Deysher M (1986) Caloric compensation and sensory specific satiety: Evidence for self-regulation of food intake by young children. *Appetite* 7: 323-331

Birch LL, Fisher JA (1995) Appetite and eating behavior in children. *Pediatr Clin North Am* 42: 931-953

Bithoney W, Dubowitz H, Egan H (1992) Failure to thrive/growth deficiency. *Pediatr Rev* 13: 453-460

Boot MT, Cairncross S, eds. (1993) *Actions Speak, the Study of Hygiene Behaviour in water and Sanitation Projects.* The Hague: IRC International Water and Sanitation Centre, London School of Hygiene and Tropical Medicine

Brown KH, Peerson JM, Lopez de Romana G, de Kanashiro HC, Black RE (1995) Validity and epidemiology of reported poor appetite among Peruvian infants from a low-income, peri-urban community. *American Journal of Clinical Nutrition* 61: 26-32

Brown KH, Creed-Kanashiro H, Dewey KG (1995) Optimal complementary feeding practices to prevent childhood malnutrition in developing countries. *Food and Nutrition Bulletin* 16: 320-339

Brown K, Dewey K, Allen L (1998) *Complementary feeding of young children in developing countries: A review of current scientific knowledge.* Geneva: World Health Organization

Brown KH, Peerson JM, Allen LH (1998) Effect of zinc supplementation on children's growth; a meta-analysis of intervention trials. In *Role of trace elements for health promotion and disease prevention*, ed. Sandstrom B, Walter P. Bibliotheca Nutritio et Dieta, No. 54, pp 76-83. Basel: Karger

Brown KH, Black RE, Lopez de Romana G, Creed de Kanashiro H (1989) Infant feeding practices and their relationship with diarrhea and other diseases in Huascar (Lima), Peru. *Pediatrics* 83: 31-40

Brown K, Dickin K, Bentley M, Oni G, Obasaju V, Esrey S, Mebrahtu S, Stallings R (1988) Consumption of weaning foods from fermented cereals in Kwara State, Nigeria. In *Improving young child feeding in eastern and southern Africa: Household-level food technology*, ed. Alnwick D, Moses S, Schmidt O, pp 181-197. Ottawa, Canada: International Development Research Centre

Cairncross S, Kochar V, eds. (1994) *Studying hygiene behaviour: Methods, issues and experiences.* New Delhi, India: Sage Publications

Carmines E, Zeller R (1979) *Reliability and validity assessment.* Beverly Hills and London: Sage Publications

Caulfield LE, Huffman SL, Piwoz EG (1999) *Interventions to improve complementary food intakes of six- to 12-month-old infants in developing countries: Impact on growth, prevalence of malnutrition, and potential contribution to child survival*. Washington, D.C.: The Linkages Project, Academy for Educational Development

Chatoor I, Hirsch R, Ganiban J, Persinger M, Hamburger E (1998) Diagnosing infantile anorexia: The observation of mother-infant interactions. *J Am Acad Child Adolesc Psychiatry* 37: 959-967

Chen LC (1983) Interactions of diarrhea and malnutrition: Mechanisms and interventions. In *Diarrhea and malnutrition: Interactions, mechanisms, and interventions*, ed. Chen LC, Scrimshaw NS. New York: Plenum Press

Cousens S, Kanki B, Toure S, Diallo I, Curtis V (1996) Reactivity and repeatability of hygiene behaviour: Structured observations from Burkina Faso. *Social Science and Medicine* 43: 1299-1308

Curtis V, Cairncross S, Yonli R (2000) Domestic hygiene and diarrhoea—Pinpointing the problem. *Tropical Medicine and International Health* 5: 22-32

Curtis V, Cousens S, Mertens T, Traore E, Kanki B, Diallo I (1993) Structured observations of hygiene behaviours in Burkina Faso: Validity, variability, and utility. *Bulletin of the World Health Organization* 71: 23-32

Curtis V, Kanki B, Cousens S, Sanou A, Diallo I, Mertens T (1997) Dirt and diarrhoea: Formative research in hygiene promotion programmes. *Health Policy and Planning* 12: 122-131

Dettwyler KA (1986) Infant feeding in Mali, West Africa: Variations in belief and practice. *Social Science and Medicine* 23: 651-664

Dettwyler KA (1987) Breastfeeding and weaning in Mali: Cultural context and hard data. *Social Science and Medicine* 24: 633-644

Dettwyler KA (1989a) Interaction of anorexia and cultural beliefs in infant malnutrition in Mali. *American Journal of Human Biology* 1: 683-695

Dettwyler KA (1989b) Styles of infant feeding: Parental/caretaker control of food consumption in young children. *American Anthropologist* 91: 696-703

Dettwyler KA (1991) Growth status of children in rural Mali: Implications for nutrition education programs. *American Journal of Human Biology* 3: 447-462

Dettwyler KA (1992) The biocultural approach in nutritional anthropology: Case studies of malnutrition in Mali. *Medical Anthropology* 15: 17-39

DeVellis R (1991) *Scale development: Theory and applications.* Newbury Park, Calif.: Sage Publications, Inc.

Di Iorio SN, Rodrigo MA (1996) Maternal competence and infant malnutrition: An instrument for its evaluation. *Archivos Latinoamericanos de Nutricion* 46: 132-135

Dickin K, Griffiths M, Piwoz E (1997) *Designing by dialogue. A program planner's guide to consultative research for improving young child feeding.* Washington, D.C.: SARA Project, Academy for Educational Development (AED)

Dikassa L, Mock N, Magnani R, Rice J, Abdoh A, Mercer D, Bertrand W (1993) Maternal behavioural risk factors for severe childhood diarrhoeal disease in Kinshasa, Zaire. *International Journal of Epidemiology* 22: 327-333

Drotar D (1991) The family context of nonorganic failure to thrive. *Am J Orthopsychiatry* 61: 23-34

Drotar D, Eckerle D, Satola J, Wyatt B (1990) Maternal interactional behavior with non-organic failure-to-thrive infants: A case comparison study. *Child Abuse Negl* 14: 41-51

Drucker RR, Hammer LD, Agras WS, Bryson S (1999) Can mothers influence their child's eating behavior? *J Dev Behav Pediatr* 20: 88-92

Ekanem EE, Akitoye CO, Adedeji OT (1991) Food hygiene behaviour and childhood diarrhoea in Lagos, Nigeria: A case-control study. *Journal of Diarrhoeal Disease Research* 9: 219-226

Engle P (1992) *Childcare and nutrition. Theme paper for the International Nutrition Conference (ICN).* New York: United Nations Children's Fund (UNICEF)

Engle P, Lhotska L (1999) The role of care in programmatic actions for nutrition: Designing programs involving care. *Food and Nutrition Bulletin* 20: 121-135

Engle P, Ricciuti H (1995) Psychosocial aspects of care. *Food and Nutrition Bulletin* 16: 356-377

Engle P, Zeitlin M (1996) Active feeding behavior compensates for low interest in food among young Nicaraguan children. *Journal of Nutrition* 126: 1808-1816

Engle P, Bentley M, Pelto G (2000) The role of care in nutrition research programmes: Current research and a research agenda. *Proceedings of the Nutrition Society* 59: 25-35

Engle PL, Lhotska L, Armstrong H (1997) *The care initiative: Assessment, analysis and action to improve care for nutrition.* New York: Nutrition Section, United Nations Children's Fund (UNICEF)

Engle PL, Menon P, Haddad L (1996) Care and nutrition: Concepts and measurement. Food Consumption and Nutrition Division Discussion Paper #18, International Food Policy Research Institute, Washington, D.C.

Favin M, Baume C (1996) *A guide to qualitative research for improving breastfeeding practices.* Washington, D.C.: The Manoff Group and Wellstart International's Expanded Promotion of Breastfeeding Program

Fomon A, Wilson J (1993) *Nutrition of normal infants.* St. Louis, Mo.: Mosby

Frank D, Silva M, Needlman R (1993) Failure to thrive: Mystery, myth, and method. *Contemporary Pediatrics* 10: 114-133

Galler JR, Ramsey FC, Harrison RH, Brooks R, Weiskopf-Bock S (1998) Infant feeding practices in Barbados predict later growth. *Journal of Nutrition* 128: 1328-1335

Gittelsohn J (1991) Opening the box: Intrahousehold food allocation in rural Nepal. *Social Science and Medicine* 33: 1141-1154

Gittelsohn J, Shankar A, Ram R, Gnywali T, West K (1997) Estimating reactivity and its effects in direct observation studies of health behavior. *Human Organization* 56: 182-189

Gittelsohn J, Shankar AV, West KP Jr, Faruque F, Gnywali T, Pradhan EK (1998) Child feeding and care behaviors are associated with xerophthalmia in rural Nepalese households. *Social Science and Medicine* 47: 477-486

Golden EG, Golden MHN (1991) Relationships among dietary quality, children's appetites, growth stunting, and efficiency of growth in poor populations. *Food and Nutrition Bulletin* 13: 105-109

Gorter AC, Sandiford P, Pauw J, Morales R, Perez RM, Alberts H (1998) Hygiene behaviour in rural Nicaragua in relation to diarrhoea. *International Journal of Epidemiology* 27: 1090-1100

Green Abate C (undated) *"Wise mothers." Building on community wisdom to improve child nutrition. Positive deviance study.* Save the Children Fund.

Griffiths M, Piwoz E., Favin M, Del Rosso J (1988) *Improving young child feeding during diarrhea.* Arlington, Va.: PRITECH/U.S. Agency for International Development (USAID)

Gryboski KL (1996) Maternal and nonmaternal time-allocation to infant care, and care during infant illness in rural Java, Indonesia. *Social Science and Medicine* 43: 209-219

Guldan GS, et al. (1993a) Weaning practices and growth in rural Sichuan infants: A positive deviance study. *Journal of Tropical Pediatrics* 39: 169-175

Guldan G, Zeitlin M, Beiser A, Super C, Gershoff S, Datta S (1993b) Maternal education and child feeding practices in rural Bangladesh. *Social Science and Medicine* 36: 925-935

Habicht J-P (1996) Epidemiology for scientific and programmatic decision-making. In *Beyond nutritional recommendations: Implementing science for healthier populations*, ed. Garza C, Haas JD, Habicht J-P, Pelletier DL. Proceedings from the 14th Annual Bristol-Myers Squibb/Mead Johnson Nutrition Research Symposium, June 5-7, 1995, Washington, D.C. Ithaca, NY: Division of Nutritional Sciences, Cornell University

Hadju V, Stephenson LS, Abadi K, Mohammed HO, Bowman DD, Parker RS (1996) Improvements in appetite and growth in helminth-infected schoolboys three and seven weeks after a single dose of pyrantel pamoate. *Parasitology* 113: 497-504

Haggerty PA, Muladi K, Kirkwood BR, Ashworth A, Manunebo M (1994) Community-based hygiene education to reduce diarrhoeal disease in rural Zaire: Impact of the intervention on diarrhoeal morbidity. *International Journal of Epidemiology* 23: 1050-1059

Helen Keller International (HKI) (undated) *Changing behaviors: Guidelines on using research to increase consumption of micronutrients.* New York: Helen Keller International

Homer C, Ludwig S (1981) Categorization of etiology of failure to thrive. *Am J Dis Child* 135: 848-851

Hop LT, Gross R, Giay T, Sastroamidjojo S, Schultink W, Lang NT (2000) Premature complementary feeding is associated with poorer growth of Vietnamese children. *Journal of Nutrition* 130: 2683-2690

Hoque BA, Juncker T, Sack RB, Ali M, Aziz KM (1996) Sustainability of a water, sanitation and hygiene education project in rural Bangladesh: A 5-year follow-up. *Bulletin of the World Health Organization* 74: 431-437

ICN (International Conference on Nutrition) (1992) *Plan of action for nutrition*. Rome

Jonsson U (1995) Ethics and child nutrition. *Food and Nutrition Bulletin* 16: 293-298

Kajeckas M, McSorely MA, Fanomezana RO, Keith N, Guyon A (1998) *Influences on nutritional behaviors: Comparing well-nourished and malnourished children using positive negative deviance methodology.* Research Report. Washington, D.C.: Academy for Educational Development, BASICS, LINKAGES

Kaltenthaler EC, Drasar BS (1996) The study of hygiene behaviour in Botswana: A combination of qualitative and quantitative methods. *Tropical Medicine and International Health* 1: 690-698

Kaltenthaler EC, Pinfold JV (1995) Microbiological methods for assessing handwashing practice in hygiene behaviour studies. *Journal of Tropical Medicine and Hygiene* 98: 101-106

Khan M, Ahmad K (1986) Withdrawal of food during diarrhoea: Major mechanism of malnutrition following diarrhoea in Bangladeshi children. *Journal of Tropical Pediatrics* 32: 57-61

Klesges R, Coates T, Brown G, Sturgeon-Tillisch J, Moldenhauer-Klesges L, Holzer B, Woolfrey J, Vollmer J (1983) Parental influences on children's eating behavior and relative weight. *J Appl Behav Anal* 16: 371-378

Krebs N, Hambidge K, Walravens P (1984) Increased food intake of young children receiving a zinc supplement. *Am J Dis Child* 138: 270-273

Kumar Range S, Naved R, Bhattarai S (1997) Childcare practices associated with positive and negative nutritional outcomes for children in Bangladesh: A descriptive analysis. Food Consumption and Nutrition Division Discussion Paper 24, International Food Policy Research Institute, Washington, D.C.

Kumar V, Clements C, Marwah K, Diwedi P (1985) Beliefs and therapeutic preferences of mothers in management of acute diarrhoeal disease in children. *Journal of Tropical Pediatrics* 21: 109-112.

Latham MC, Stephenson LS, Kurz KM, Kinoti SN (1990) Metrifonate or praziquantel treatment improves physical fitness and appetite of Kenyan schoolboys with Schistosoma haematobium and hookworm infections. *American Journal of Tropical Medicine and Hygiene* 43: 170-179

Laude M. (1999) Assessment of nutritional status, cognitive development, and mother-child interaction in Central American refugee children. *Revista Panamericana de Salud Publica* 6: 164-171

Lawless JW, Latham MC, Stephenson LS, Kinoti SN, Pertet AM (1994) Iron supplementation improves appetite and growth in anemic Kenyan primary school children. *Journal of Nutrition* 124: 645-654

Levinson FJ, Rogers BL, Hicks KM, Schaetzel T, Troy L, Young C (1999) *Monitoring and evaluation. A guidebook for nutrition project managers in developing countries.* Tools to measure performance of nutrition programs 8. Washington, D.C.: Human Development Network, World Bank

Manun'Ebo M, Cousens S, Haggerty P, Kalengaie M, Ashworth A, Kirkwood B (1997) Measuring hygiene practices: A comparison of questionnaires with direct observations in rural Zaire. *Tropical Medicine and International Health* 2: 1015-1021

Marquis GS, Habicht J-P, Lanata CF, Black RE, Rasmussen KM (1997) Breast milk or animal-product foods improve linear growth of Peruvian toddlers consuming marginal diets. *American Journal of Clinical Nutrition* 66: 1102-1109

Martorell R, Mason J, Rasmussen K, Ho TJ, Habicht J-P (1985) Child feeding practices: Knowledge, research needs, and policy implications. Cornell International Nutrition Monograph Series Number 14. In *Determinants of young child feeding and their implications for nutritional surveillance*, ed. Latham MC. Ithaca, NY: Cornell University, Program in International Nutrition

Mata L (1980) Child malnutrition and deprivation—Observations in Guatemala and Costa Rica. *Food and Nutrition Bulletin* 6: 7-14

Maxwell D, Levin C, Armar-Klemesu M, Ruel M, Morris S, Ahiadeke C (2000) *Urban livelihoods and food and nutrition security in greater Accra, Ghana.* Research Report 112. Washington, D.C.: International Food Policy Research Institute

McIver J, Carmines E (1981) *Unidimensional scaling.* Beverly Hills and London: Sage Publications

Menon P, Ruel. MT (2000) Quantifying the association between child feeding practices and nutritional status: Experience with the Demographic & Health Surveys. *FASEB J* 14 (4): A504 (Abstract # 356.6).

Merchant SS, Udipi SA (1997) Positive and negative deviance in growth of urban slum children in Bombay. *Food and Nutrition Bulletin* 18: 323-336

Monte CM, Ashworth A, Nations MK, Lima AA, Barreto A, Huttly SR (1997) Designing educational messages to improve weaning food hygiene practices of families living in poverty. *Social Science and Medicine* 44: 1453-1464

Muñoz de Chavez M, Arroyo P, Perez Gil S, Hernandez M, Quiroz S, Rodriguez M, de Hermelo M, Chavez A (1974) The epidemiology of good nutrition in a population with a high prevalence of malnutrition. *Ecology of Food and Nutrition* 3: 223-230

Odujinrin OM, Akitoye CO, Odugbemi T, Oyerinde JP, Esumeh FI (1993) Ethnographic study on childhood diarrhoeal diseases in a rural Nigerian community. *West Afr J Med* 12: 185-188

Omotade OO, Kayode CM, Adeyemo AA, Oladepo O (1995) Observations on handwashing practices of mothers and environmental conditions in Ona-Ara Local Government Area of Oyo State, Nigeria. *J Diarrhoeal Dis Res* 13: 224-228

Oyemade A, Omokohdion FO, Olawuyi JF, Sridhar MK, Olaseha IO (1998) Environmental and personal hygiene practices: Risk factors for diarrhoea among children of Nigerian market women. *Journal of Diarrhoeal Diseases Research* 16: 241-247

Pinfold JV, Horan NJ (1996) Measuring the effect of a hygiene behaviour intervention by indicators of behaviour and diarrhoeal disease. *Trans R Soc Trop Med Hyg* 90: 366-371

Piwoz EG, Black RE, Lopez de Romana G, Creed de Kanashiro H, Brown KH (1994) The relationship between infants' preceding appetite, illness, and growth performance and mothers' subsequent feeding practice decisions. *Social Science and Medicine* 39: 851-860.

Popkin BM, Adair L, Akin JS, Black R, Briscoe J, Flieger W (1990) Breast-feeding and diarrhea morbidity. *Pediatrics* 86: 874-882

Quick RE, Venczel LV, Mintz ED, Soleto L, Aparicio J, Gironaz M, Hutwagner L, Greene K, Bopp C, Maloney K, Sobsey M, Tauxe RV (1999) Diarrhoea prevention in Bolivia through point-of-use water treatment and safe storage: A promising new strategy. *Epidemiol Infect* 122: 83-90

Rolls BJ (1986) Sensory-specific satiety. *Nutrition Reviews* 44: 93-101

Ruel MT (2001) The natural history of growth failure: Importance of intrauterine and postnatal periods. In *Nutrition and growth*, ed. Martorell R, Haschke F, pp 123-158. Nestlé Nutrition Workshop Series, Pediatric Program, Vol. 47. Nestec Ltd. Philadelphia, Pa.:Vevey/Lippincott Williams & Wilkins

Ruel MT, Menon P (in revision). Quantifying the association between child feeding practices and nutritional status in Latin America: Innovative uses of the Demographic and Health Surveys. Submitted to *Journal of Nutrition.*

Ruel MT, Armar-Klemesu M, Arimond M (2001) A multiple-method approach to studying childcare in an urban environment: The case of Accra, Ghana. Food Consumption and Nutrition Division Discussion Paper 116. International Food Policy Research Institute: Washington, D.C.

Ruel MT, Levin CE, Armar-Klemesu M, Maxwell DG, Morris SS (1999) Good care practices mitigate the negative effects of poverty and low maternal schooling on children's nutritional status: Evidence from Accra. *World Development* 27: 1993-2009

Rutstein SO (1996) *Factors influencing the nutritional status of mothers and children in Sub-Saharan Africa*. An analytical report based on the Demographic and Health Surveys. Calverton, Md.: MACRO International

Sanders M, Patel R, LeGrice B, Shephard R (1993) Children with persistent feeding difficulties: An observational analysis of the feeding interactions of problem and nonproblem eaters. *Health Psychol* 12: 64-73

Shahid NS, Greenough WB 3rd, Samadi AR, Huq MI, Rahman N (1996) Hand washing with soap reduces diarrhoea and spread of bacterial pathogens in a Bangladesh village. *Journal of Diarrhoeal Diseases Research* 14: 85-89

Shawyer RJ, bin Gani AS, Punufimana AN, Seuseu NK (1996) The role of clinical vignettes in rapid ethnographic research: A folk taxonomy of diarrhoea in Thailand. *Social Science and Medicine* 42: 111-123

Shekar M, Habicht J-P, Latham MC (1991) Is positive deviance in growth simply the converse of negative deviance? *Food and Nutrition Bulletin* 13: 7-11

Shekar M, Habicht J-P, Latham MC (1992) Use of positive-negative deviant analysis to improve programme targeting and services: Example from the Tamil Nadu Integrated Nutrition Project. *International Journal of Epidemiology* 21: 707-713

Smitasiri S, Attig GA, Valyasevi A, Dhanamitta S, Tontisirin K (1993) *Social marketing vitamin A-rich foods in Thailand. A model nutrition communicatio for behavior change process.* Bangkok, Thailand: Institute of Nutrition, Mahidol University

Stanton B, Clemens J, Aziz K, Rahaman M (1987) Twenty-four hour recall, knowledge-attitude-practice and direct observations of sanitary practices: A comparative study. *Bulletin of the World Health Organization* 65: 217-222

Thongkrajai E, Thongkrajai P, Stoeckel J, Na-nakhon S, Karenjanabutr B, Sirivatanamethanont J (1990) Socioeconomic and health programme effects upon the behavioral management of diarrhoeal disease in northeast Thailand. *Asia Pac J Public Health* 4: 45-52

Traore E, Cousens S, Curtis V, Mertens T, Tall F, Traore A, Kanki B, Diallo I, Rochereau A, Chiron JP, et al. (1994) Child defecation behaviour, stool disposal practices, and childhood diarrhoea in Burkina Faso: Results from a case-control study. *J Epidemiol Community Health* 48: 270-275

Umeta M, West CE, Haidar J, Deurenberg P, Hautvast JG (2000) Zinc supplementation and stunted infants in Ethiopia: A randomised controlled trial. *Lancet* 355: 2021-2026

Underwood B (1985) Weaning practices in deprived environments: The weaning dilemma. *Pediatrics* 194-198

UNICEF (United Nations Children's Fund) (1990) *Strategy for improved nutrition of children and women in developing countries.* New York: UNICEF Nutrition Section

Valenzuela M (1997) Maternal sensitivity in a developing society: The context of urban poverty and infant chronic undernutrition. *Dev Psychol* 33: 845-855

Vazir S, Naidu AN, Vidyasagar P (1998) Nutritional status, psychosocial development and the home environment of Indian rural children. *Indian Pediatrics* 35: 959-966

Victora CG, Smith PG, Vaughan JP, et al. (1989) Infant feeding and deaths due to diarrhea. A case-control study. *American Journal of Epidemiology* 129: 1032-1041

WHO (World Health Organization) (1995) The World Health Organization's infant-feeding recommendations. *Bulletin of the World Health Organization* 73: 165-174

Wishik SM, Van der Vynckt S (1976) The use of nutritional "positive deviants" to identify approaches for modification of dietary practices. *American Journal of Public Health* 66: 38-42

Wollinka O, Keeley E, Burkhalter BR, Bashir N (1997) *Hearth Nutrition Model: Applications in Haiti, Vietnam, and Bangladesh*. Arlington, Va.: BASICS

Yeager BA, Huttly SR, Bartolini R, Rojas M, Lanata CF (1999) Defecation practices of young children in a Peruvian shanty town. *Social Science and Medicine* 49: 531-541

Zeitlin M (1991) Nutritional resilience in a hostile environment: Positive deviance in child nutrition. *Nutrition Reviews* 49: 259-268

Zeitlin M (1996) Childcare and nutrition: The findings from positive deviance research. Report to UNICEF, Positive Deviance in Nutrition Research Project. International Nutrition Monograph Series. Ithaca, NY: Cornell University Program in International Nutrition

Zeitlin M, Ghassemi H, Mansour M (1990) *Positive deviance in child nutrition*. Tokyo: United Nations University

Zeitlin MF, Ahmed NU, Beiser AS, Zeitlin JA, Super CM, Guldan GS (1995) Developmental, behavioural, and environmental risk factors for diarrhoea among rural Bangladeshi children of less than two years. *Journal of Diarrhoeal Disease Research* 13: 99-105

Zinc Investigators' Collaborative Group (Black R, Bhutta Z, Brown K, Gardner J, Gore S, Hidayat A, Khatun F, Martorell R, Ninh N, Penny M, Rosado J, Roy S, Ruel M., Szawal S, Shankar A) (1999) Prevention of diarrhea and acute lower respiratory infection by zinc supplementation in developing country children: Pooled analysis of randomized controlled trials. *Journal of Pediatrics* 135: 689-697

Zumrawi F, Vaughan JP, Waterlow JC, Kirkwood BR (1981) Dried skimmed milk, breast-feeding and illness episodes--a controlled trial in young children in Khartoum Province, Sudan. *International Journal of Epidemiology* 10: 303-308

FCND DISCUSSION PAPERS

01 *Agricultural Technology and Food Policy to Combat Iron Deficiency in Developing Countries*, Howarth E. Bouis, August 1994

02 *Determinants of Credit Rationing: A Study of Informal Lenders and Formal Credit Groups in Madagascar*, Manfred Zeller, October 1994

03 *The Extended Family and Intrahousehold Allocation: Inheritance and Investments in Children in the Rural Philippines*, Agnes R. Quisumbing, March 1995

04 *Market Development and Food Demand in Rural China*, Jikun Huang and Scott Rozelle, June 1995

05 *Gender Differences in Agricultural Productivity: A Survey of Empirical Evidence*, Agnes R. Quisumbing, July 1995

06 *Gender Differentials in Farm Productivity: Implications for Household Efficiency and Agricultural Policy*, Harold Alderman, John Hoddinott, Lawrence Haddad, and Christopher Udry, August 1995

07 *A Food Demand System Based on Demand for Characteristics: If There Is "Curvature" in the Slutsky Matrix, What Do the Curves Look Like and Why?*, Howarth E. Bouis, December 1995

08 *Measuring Food Insecurity: The Frequency and Severity of "Coping Strategies,"* Daniel G. Maxwell, December 1995

09 *Gender and Poverty: New Evidence from 10 Developing Countries*, Agnes R. Quisumbing, Lawrence Haddad, and Christine Peña, December 1995

10 *Women's Economic Advancement Through Agricultural Change: A Review of Donor Experience*, Christine Peña, Patrick Webb, and Lawrence Haddad, February 1996

11 *Rural Financial Policies for Food Security of the Poor: Methodologies for a Multicountry Research Project*, Manfred Zeller, Akhter Ahmed, Suresh Babu, Sumiter Broca, Aliou Diagne, and Manohar Sharma, April 1996

12 *Child Development: Vulnerability and Resilience*, Patrice L. Engle, Sarah Castle, and Purnima Menon, April 1996

13 *Determinants of Repayment Performance in Credit Groups: The Role of Program Design, Intra-Group Risk Pooling, and Social Cohesion in Madagascar*, Manfred Zeller, May 1996

14 *Demand for High-Value Secondary Crops in Developing Countries: The Case of Potatoes in Bangladesh and Pakistan*, Howarth E. Bouis and Gregory Scott, May 1996

15 *Repayment Performance in Group-Based credit Programs in Bangladesh: An Empirical Analysis*, Manohar Sharma and Manfred Zeller, July 1996

16 *How Can Safety Nets Do More with Less? General Issues with Some Evidence from Southern Africa*, Lawrence Haddad and Manfred Zeller, July 1996

17 *Remittances, Income Distribution, and Rural Asset Accumulation*, Richard H. Adams, Jr., August 1996

18 *Care and Nutrition: Concepts and Measurement*, Patrice L. Engle, Purnima Menon, and Lawrence Haddad, August 1996

19 *Food Security and Nutrition Implications of Intrahousehold Bias: A Review of Literature*, Lawrence Haddad, Christine Peña, Chizuru Nishida, Agnes Quisumbing, and Alison Slack, September 1996

20 *Macroeconomic Crises and Poverty Monitoring: A Case Study for India*, Gaurav Datt and Martin Ravallion, November 1996

21 *Livestock Income, Male/Female Animals, and Inequality in Rural Pakistan*, Richard H. Adams, Jr., November 1996

22 *Alternative Approaches to Locating the Food Insecure: Qualitative and Quantitative Evidence from South India*, Kimberly Chung, Lawrence Haddad, Jayashree Ramakrishna, and Frank Riely, January 1997

FCND DISCUSSION PAPERS

23 *Better Rich, or Better There? Grandparent Wealth, Coresidence, and Intrahousehold Allocation*, Agnes R. Quisumbing, January 1997

24 *Childcare Practices Associated with Positive and Negative Nutritional Outcomes for Children in Bangladesh: A Descriptive Analysis*, Shubh K. Kumar Range, Ruchira Naved, and Saroj Bhattarai, February 1997

25 *Water, Health, and Income: A Review*, John Hoddinott, February 1997

26 *Why Have Some Indian States Performed Better Than Others at Reducing Rural Poverty?*, Gaurav Datt and Martin Ravallion, March 1997

27 *"Bargaining" and Gender Relations: Within and Beyond the Household*, Bina Agarwal, March 1997

28 *Developing a Research and Action Agenda for Examining Urbanization and Caregiving: Examples from Southern and Eastern Africa*, Patrice L. Engle, Purnima Menon, James L. Garrett, and Alison Slack, April 1997

29 *Gender, Property Rights, and Natural Resources*, Ruth Meinzen-Dick, Lynn R. Brown, Hilary Sims Feldstein, and Agnes R. Quisumbing, May 1997

30 *Plant Breeding: A Long-Term Strategy for the Control of Zinc Deficiency in Vulnerable Populations*, Marie T. Ruel and Howarth E. Bouis, July 1997

31 *Is There an Intrahousehold 'Flypaper Effect'? Evidence from a School Feeding Program*, Hanan Jacoby, August 1997

32 *The Determinants of Demand for Micronutrients: An Analysis of Rural Households in Bangladesh*, Howarth E. Bouis and Mary Jane G. Novenario-Reese, August 1997

33 *Human Milk—An Invisible Food Resource*, Anne Hatløy and Arne Oshaug, August 1997

34 *The Impact of Changes in Common Property Resource Management on Intrahousehold Allocation*, Philip Maggs and John Hoddinott, September 1997

35 *Market Access by Smallholder Farmers in Malawi: Implications for Technology Adoption, Agricultural Productivity, and Crop Income*, Manfred Zeller, Aliou Diagne, and Charles Mataya, September 1997

36 *The GAPVU Cash Transfer Program in Mozambique: An assessment*, Gaurav Datt, Ellen Payongayong, James L. Garrett, and Marie Ruel, October 1997

37 *Why Do Migrants Remit? An Analysis for the Dominican Sierra*, Bénédicte de la Brière, Alain de Janvry, Sylvie Lambert, and Elisabeth Sadoulet, October 1997

38 *Systematic Client Consultation in Development: The Case of Food Policy Research in Ghana, India, Kenya, and Mali*, Suresh Chandra Babu, Lynn R. Brown, and Bonnie McClafferty, November 1997

39 *Whose Education Matters in the Determination of Household Income: Evidence from a Developing Country*, Dean Jolliffe, November 1997

40 *Can Qualitative and Quantitative Methods Serve Complementary Purposes for Policy Research? Evidence from Accra*, Dan Maxwell, January 1998

41 *The Political Economy of Urban Food Security in Sub-Saharan Africa*, Dan Maxwell, February 1998

42 *Farm Productivity and Rural Poverty in India*, Gaurav Datt and Martin Ravallion, March 1998

43 *How Reliable Are Group Informant Ratings? A Test of Food Security Rating in Honduras*, Gilles Bergeron, Saul Sutkover Morris, and Juan Manuel Medina Banegas, April 1998

44 *Can FAO's Measure of Chronic Undernourishment Be Strengthened?*, Lisa C. Smith, with a *Response* by Logan Naiken, May 1998

45 *Does Urban Agriculture Help Prevent Malnutrition? Evidence from Kampala*, Daniel Maxwell, Carol Levin, and Joanne Csete, June 1998

46 *Impact of Access to Credit on Income and Food Security in Malawi*, Aliou Diagne, July 1998

FCND DISCUSSION PAPERS

47 *Poverty in India and Indian States: An Update*, Gaurav Datt, July 1998

48 *Human Capital, Productivity, and Labor Allocation in Rural Pakistan*, Marcel Fafchamps and Agnes R. Quisumbing, July 1998

49 *A Profile of Poverty in Egypt: 1997*, Gaurav Datt, Dean Jolliffe, and Manohar Sharma, August 1998.

50 *Computational Tools for Poverty Measurement and Analysis*, Gaurav Datt, October 1998

51 *Urban Challenges to Food and Nutrition Security: A Review of Food Security, Health, and Caregiving in the Cities*, Marie T. Ruel, James L. Garrett, Saul S. Morris, Daniel Maxwell, Arne Oshaug, Patrice Engle, Purnima Menon, Alison Slack, and Lawrence Haddad, October 1998

52 *Testing Nash Bargaining Household Models With Time-Series Data*, John Hoddinott and Christopher Adam, November 1998

53 *Agricultural Wages and Food Prices in Egypt: A Governorate-Level Analysis for 1976-1993*, Gaurav Datt and Jennifer Olmsted, November 1998

54 *Endogeneity of Schooling in the Wage Function: Evidence from the Rural Philippines*, John Maluccio, November 1998

55 *Efficiency in Intrahousehold Resource Allocation*, Marcel Fafchamps, December 1998

56 *How Does the Human Rights Perspective Help to Shape the Food and Nutrition Policy Research Agenda?*, Lawrence Haddad and Arne Oshaug, February 1999

57 *The Structure of Wages During the Economic Transition in Romania*, Emmanuel Skoufias, February 1999

58 *Women's Land Rights in the Transition to Individualized Ownership: Implications for the Management of Tree Resources in Western Ghana*, Agnes Quisumbing, Ellen Payongayong, J. B. Aidoo, and Keijiro Otsuka, February 1999

59 *Placement and Outreach of Group-Based Credit Organizations: The Cases of ASA, BRAC, and PROSHIKA in Bangladesh*, Manohar Sharma and Manfred Zeller, March 1999

60 *Explaining Child Malnutrition in Developing Countries: A Cross-Country Analysis*, Lisa C. Smith and Lawrence Haddad, April 1999

61 *Does Geographic Targeting of Nutrition Interventions Make Sense in Cities? Evidence from Abidjan and Accra*, Saul S. Morris, Carol Levin, Margaret Armar-Klemesu, Daniel Maxwell, and Marie T. Ruel, April 1999

62 *Good Care Practices Can Mitigate the Negative Effects of Poverty and Low Maternal Schooling on Children's Nutritional Status: Evidence from Accra*, Marie T. Ruel, Carol E. Levin, Margaret Armar-Klemesu, Daniel Maxwell, and Saul S. Morris, April 1999

63 *Are Urban Poverty and Undernutrition Growing? Some Newly Assembled Evidence*, Lawrence Haddad, Marie T. Ruel, and James L. Garrett, April 1999

64 *Some Urban Facts of Life: Implications for Research and Policy*, Marie T. Ruel, Lawrence Haddad, and James L. Garrett, April 1999

65 *Are Determinants of Rural and Urban Food Security and Nutritional Status Different? Some Insights from Mozambique*, James L. Garrett and Marie T. Ruel, April 1999

66 *Working Women in an Urban Setting: Traders, Vendors, and Food Security in Accra*, Carol E. Levin, Daniel G. Maxwell, Margaret Armar-Klemesu, Marie T. Ruel, Saul S. Morris, and Clement Ahiadeke, April 1999

67 *Determinants of Household Access to and Participation in Formal and Informal Credit Markets in Malawi*, Aliou Diagne, April 1999

68 *Early Childhood Nutrition and Academic Achievement: A Longitudinal Analysis*, Paul Glewwe, Hanan Jacoby, and Elizabeth King, May 1999

FCND DISCUSSION PAPERS

69 *Supply Response of West African Agricultural Households: Implications of Intrahousehold Preference Heterogeneity*, Lisa C. Smith and Jean-Paul Chavas, July 1999

70 *Child Health Care Demand in a Developing Country: Unconditional Estimates from the Philippines*, Kelly Hallman, August 1999

71 *Social Capital and Income Generation in South Africa, 1993-98*, John Maluccio, Lawrence Haddad, and Julian May, September 1999

72 *Validity of Rapid Estimates of Household Wealth and Income for Health Surveys in Rural Africa*, Saul S. Morris, Calogero Carletto, John Hoddinott, and Luc J. M. Christiaensen, October 1999

73 *Social Roles, Human Capital, and the Intrahousehold Division of Labor: Evidence from Pakistan*, Marcel Fafchamps and Agnes R. Quisumbing, October 1999

74 *Can Cash Transfer Programs Work in Resource-Poor Countries? The Experience in Mozambique*, Jan W. Low, James L. Garrett, and Vitória Ginja, October 1999

75 *Determinants of Poverty in Egypt, 1997*, Gaurav *Datt* and Dean Jolliffe, October 1999

76 *Raising Primary School Enrolment in Developing Countries: The Relative Importance of Supply and Demand*, Sudhanshu Handa, November 1999

77 *The Political Economy of Food Subsidy Reform in Egypt*, Tammi Gutner, November 1999.

78 *Determinants of Poverty in Mozambique: 1996-97*, Gaurav Datt, Kenneth Simler, Sanjukta Mukherjee, and Gabriel Dava, January 2000

79 *Adult Health in the Time of Drought*, John Hoddinott and Bill Kinsey, January 2000

80 *Nontraditional Crops and Land Accumulation Among Guatemalan Smallholders: Is the Impact Sustainable?* Calogero Carletto, February 2000

81 *The Constraints to Good Childcare Practices in Accra: Implications for Programs*, Margaret Armar-Klemesu, Marie T. Ruel, Daniel G. Maxwell, Carol E. Levin, and Saul S. Morris, February 2000

82 *Pathways of Rural Development in Madagascar: An Empirical Investigation of the Critical Triangle of Environmental Sustainability, Economic Growth, and Poverty Alleviation*, Manfred Zeller, Cécile Lapenu, Bart Minten, Eliane Ralison, Désiré Randrianaivo, and Claude Randrianarisoa, March 2000

83 *Quality or Quantity? The Supply-Side Determinants of Primary Schooling in Rural Mozambique*, Sudhanshu Handa and Kenneth R. Simler, March 2000

84 *Intrahousehold Allocation and Gender Relations: New Empirical Evidence from Four Developing Countries*, Agnes R. Quisumbing and John A. Maluccio, April 2000

85 *Intrahousehold Impact of Transfer of Modern Agricultural Technology: A Gender Perspective*, Ruchira Tabassum Naved, April 2000

86 *Women's Assets and Intrahousehold Allocation in Rural Bangladesh: Testing Measures of Bargaining Power*, Agnes R. Quisumbing and Bénédicte de la Brière, April 2000

87 *Changes in Intrahousehold Labor Allocation to Environmental Goods Collection: A Case Study from Rural Nepal*, Priscilla A. Cooke, May 2000

88 *The Determinants of Employment Status in Egypt*, Ragui Assaad, Fatma El-Hamidi, and Akhter U. Ahmed, June 2000

89 *The Role of the State in Promoting Microfinance Institutions*, Cécile Lapenu, June 2000

90 *Empirical Measurements of Households' Access to Credit and Credit Constraints in Developing Countries: Methodological Issues and Evidence*, Aliou Diagne, Manfred Zeller, and Manohar Sharma, July 2000

91 *Comparing Village Characteristics Derived From Rapid Appraisals and Household Surveys: A Tale From Northern Mali*, Luc Christiaensen, John Hoddinott, and Gilles Bergeron, July 2000

FCND DISCUSSION PAPERS

92 *Assessing the Potential for Food-Based Strategies to Reduce Vitamin A and Iron Deficiencies: A Review of Recent Evidence*, Marie T. Ruel and Carol E. Levin, July 2000

93 *Mother-Father Resource Control, Marriage Payments, and Girl-Boy Health in Rural Bangladesh*, Kelly K. Hallman, September 2000

94 *Targeting Urban Malnutrition: A Multicity Analysis of the Spatial Distribution of Childhood Nutritional Status*, Saul Sutkover Morris, September 2000

95 *Attrition in the Kwazulu Natal Income Dynamics Study 1993-1998*, John Maluccio, October 2000

96 *Attrition in Longitudinal Household Survey Data: Some Tests for Three Developing-Country Samples*, Harold Alderman, Jere R. Behrman, Hans-Peter Kohler, John A. Maluccio, Susan Cotts Watkins, October 2000

97 *Socioeconomic Differentials in Child Stunting Are Consistently Larger in Urban Than in Rural Areas*, Purnima Menon, Marie T. Ruel, and Saul S. Morris, December 2000

98 *Participation and Poverty Reduction: Issues, Theory, and New Evidence from South Africa*, John Hoddinott, Michelle Adato, Tim Besley, and Lawrence Haddad, January 2001

99 *Cash Transfer Programs with Income Multipliers: PROCAMPO in Mexico*, Elisabeth Sadoulet, Alain de Janvry, and Benjamin Davis, January 2001

100 *On the Targeting and Redistributive Efficiencies of Alternative Transfer Instruments*, David Coady and Emmanuel Skoufias, March 2001

101 *Poverty, Inequality, and Spillover in Mexico's Education, Health, and Nutrition Program*, Sudhanshu Handa, Mari-Carmen Huerta, Raul Perez, and Beatriz Straffon, March 2001

102 *School Subsidies for the Poor: Evaluating a Mexican Strategy for Reducing Poverty*, T. Paul Schultz, March 2001

103 *Targeting the Poor in Mexico: An Evaluation of the Selection of Households for PROGRESA*, Emmanuel Skoufias, Benjamin Davis, and Sergio de la Vega, March 2001

104 *An Evaluation of the Impact of PROGRESA on Preschool Child Height*, Jere R. Behrman and John Hoddinott, March 2001

105 *The Nutritional Transition and Diet-Related Chronic Diseases in Asia: Implications for Prevention*, Barry M. Popkin, Sue Horton, and Soowon Kim, March 2001

106 *Strengthening Capacity to Improve Nutrition*, Stuart Gillespie, March 2001

107 *Rapid Assessments in Urban Areas: Lessons from Bangladesh and Tanzania*, James L. Garrett and Jeanne Downen, April 2001

108 *How Efficiently Do Employment Programs Transfer Benefits to the Poor? Evidence from South Africa*, Lawrence Haddad and Michelle Adato, April 2001

109 *Does Cash Crop Adoption Detract From Childcare Provision? Evidence From Rural Nepal*, Michael J. Paolisso, Kelly Hallman, Lawrence Haddad, and Shibesh Regmi, April 2001

110 *Evaluating Transfer Programs Within a General Equilibrium Framework*, Dave Coady and Rebecca Lee Harris, June 2001

111 *An Operational Tool for Evaluating Poverty Outreach of Development Policies and Projects*, Manfred Zeller, Manohar Sharma, Carla Henry, and Cécile Lapenu, June 2001

112 *Effective Food and Nutrition Policy Responses to HIV/AIDS: What We Know and What We Need to Know*, Lawrence Haddad and Stuart Gillespie, June 2001

113 *Measuring Power*, Elizabeth Frankenberg and Duncan Thomas, June 2001

114 *Distribution, Growth, and Performance of Microfinance Institutions in Africa, Asia, and Latin America*, Cécile Lapenu and Manfred Zeller, June 2001

FCND DISCUSSION PAPERS

115 *Are Women Overrepresented Among the Poor? An Analysis of Poverty in Ten Developing Countries,* Agnes R. Quisumbing, Lawrence Haddad, and Christina Peña, June 2001

116 *A Multiple-Method Approach to Studying Childcare in an Urban Environment: The Case of Accra, Ghana*, Marie T. Ruel, Margaret Armar-Klemesu, and Mary Arimond, June 2001

117 *An Evaluation of the Distributional Power of* PROGRESA*'s Cash Transfers in Mexico,* David P. Coady, July 2001

118 *Is* PROGRESA *Working? Summary of the Results of an Evaluation by IFPRI*, Emmanuel Skoufias and Bonnie McClafferty, July 2001